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CIVIL ENGINEERING.

Fourneyron's Turbine at St. Blasien.

The following is a plan of a quadrant of a horizontal wheel erected on Fourneyron's principle, in a cotton factory, at St. Blasien. The plan is drawn to a quarter the actual size.

In order to understand the action of the wheel, the reader must imagine the circles, of which the quarter only is drawn, completed. The machine will then be seen to consist of two parts—an inner wheel *fixed*, and an outer, or larger wheel, *revolving*. The water comes from the centre, proceeds along the guide curves F, F, which cause it to impinge directly upon the curved paddles D, D, attached to the outer wheel, which consequently revolves in the opposite direction to the impulse of the water. The shaded parts x, x, are stops attached to a drum J, J: the object of these stops is to shut off, when requisite, the communication between the inner fixed wheel and the revolving one. J, J, is capable of being raised or lowered by external machinery, and consequently x, x, descending between the guide curves, regulate the supply of water, or shut it off altogether.

Fig. 2 is a vertical section of the whole turbine, and shows the method in which the water is supplied to the revolving wheel.

The water comes first from the supply-pipe H, into the cylinder G, G, descends E, E, and falls on the fixed guide-curves F, F; from

these it rushes in horizontal streams against the paddles in the revolving wheel D, D, and finally escapes at the circumference D, D.

Fig. 2.

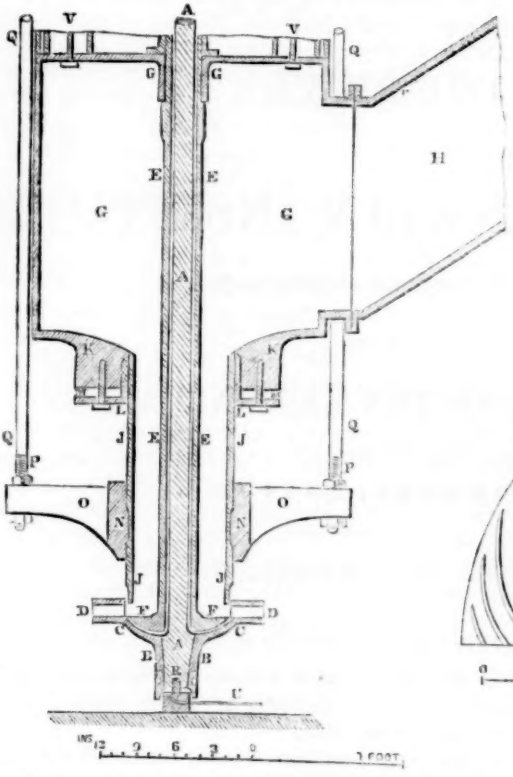

Fig. 1.

The revolving wheel is connected by C, C, with a shaft B, B, which turns on a pivot at its lower extremity. B, B, carries a main axle, A, A, which goes up through the water cylinder, and is applied to turn the machinery of the cotton factory.

J, J, as has been explained, is the sluice which regulates the supply of water. The manner in which J, J, may be raised or lowered is easily seen from the diagram. The arms O, O, contain matrices, in which the screws P, P, work: these screws are at the ends of long rods Q, Q, turned by winches not shown in the diagram. It is clear that, by turning Q, Q, one way or the other, the sluice will be either raised or lowered.

L, K, M, show the means of packing J, J, to keep it water-tight.

U is a little conduit by which oil is conducted from a small reservoir to keep the pivot R constantly lubricated.

The main shaft and pivot are of steel, the wheel of wrought iron, and all the other parts of cast iron. Though the wheel is only 12·50 inches in diameter, it drives 8000 water spindles, the roving frames, carding engines, and all the accessory machinery. The number of

revolutions, with one-third of an inch sluice-opening, are 2200 per minute. The available fall of water is 350 feet.

The following is Rühlman's account of his first impressions on examining this machine :—

The second turbine erected by the inventor at St. Blasien, with a fall of 117 yards, has become more important than any other. I can best describe this turbine by detailing what I myself saw and learned upon the spot during the journey already referred to. Already, half an hour before arriving at the remarkable locality of St. Blasien, situated in one of the most beautiful, but also of the wildest and loneliest parts of the Schwartzwald of Baden, a curious noise announces the uncommon spectacle, which becomes more extraordinary, as you approach.

On entering into the wheel-room, one learns there that what had been heard at a distance about this place was not merely mystification, but reality.

One then feels seized with astonishment, and wonders, more than in any other place, at the greatness of human ingenuity, which knows how to render subject to it the most fearful powers of nature.

At every moment the powerful pressure appears likely to burst in pieces the little wheel, and the spiral masses of water issuing from it threaten to destroy the surrounding walls and buildings. Often when I went out of the wheel-room, and looked at the enormous height from which the conducting tubes brought down the water to the wheel, the idea forced itself upon me, "that it was impossible," but that idea passed away when I went back into the little room.

Fourneyron has here, for the first time, solved a problem, which will forever render his name historical in the technical and scientific world; a problem in which he had to overcome not only the greatest obstacles of Nature, but also disfavor and prejudices in a thousand forms. Who could find any other means of utilizing this existing water power? Perhaps a water-pressure engine might be applied? Certainly not; since even without proving, by calculation, how little that kind of machine is suited for rotary motion, it is only necessary to consider the very difficult and very power-destroying conversion of a vertical reciprocating motion into a uniform rotary motion, in order to sufficiently appreciate the difficulties.

The conclusions arrived at respecting the general merits of the invention seem well worthy of attention, for they are expressed by an impartial witness, who has taken great pains to get at the truth.

It is certainly not true that turbines are capable of totally displacing vertical water-wheels as was at first asserted. The greatest obstacles to the erection, construction, and working of turbines, at least in Germany, arise from the fact that many years must elapse before our millwrights will have acquired the necessary theoretical knowledge and practical experience. With these machines everything must be really calculated. It will not do to construct one wheel after the pattern of another, or to trust to what is called the practical shape. But also the construction of these wheels, in the workshop of the machine-maker, requires the greatest care, observation, and prudence, other-

wise, no matter how it may be calculated, a good wheel cannot be produced.

It is now also fully admitted that Fourneyron deceived himself in supposing that these wheels economized 80 per cent. and more of the total available force. But the latest and fullest experience has shown that they economize certainly from 60 to 70 per cent., when those precautions are taken which should be attended to in their formation.

Civ. Eng. & Arch. Jour.

Railway Statistics.

The annual return of the Board of Trade recently published, contains some very valuable information on the subject of railway statistics. The following information is taken in a condensed form from that return:—

The total number of passengers, as given in the returns for the year ending 30th June, 1844, and for the year ending 30th June, 1845—

	1844.	1845.
1st class,	4,875,332½	5,474,163
2nd class,	12,235,686	14,325,825
3rd class,	8,583,085½	13,135,820
Mixed,	2,069,498½	855,445½
	27,763,602½	33,791,253½

The rate of increase of traveling in each class is—

1st class,	12 per cent.
2nd class,	17 per cent.
3rd class, is upwards of	50 per cent.

The amount received for each class is as follows:—

	1843–4.	1844–5.
1st class,	£1,432,688	£1,516,805
2nd class,	1,375,679	1,598,115
3rd class,	483,069	651,903
Mixed,	147,858	209,518
Total,	£3,439,294	£3,976,341

The increase of returns on the year 1844–5 was, therefore, upwards of half a million on passenger traffic alone. On gross receipts from all sources it stood thus:—

1843–4,	£5,074,674
1844–5,	6,209,714
Increase,	£1,135,040

The rate of fares on the lines included in the above returns, and the reductions in the two years, stand thus at the end of the year 1845:

	1845.				Reduction.		
	Express.	1st Class	2nd Class.	3rd Class.	1st Class.	2nd Class.	3rd Class.
	d.	d.	d.	d.	d.	d.	d.
Great Western,	3·00	2·74	1·60	1·			
London and Birmingham,	2·88	2·45	1·81	1·	·74	·32	·48
Grand Junction,	2·44	2·08	1·71	1·	·92	·41	·59
Midland,		3·21	2·19	1·			·41
Birmingham and Gloucester,		3·16	2·37	1·			
Chester and Birkenhead,		2·00	1·60	1·			
Great North of England,	3·46	2·93	2·13	1·	·53	·26	·69
Hull and Selby,		1·93	1·54	·967			
Lancaster and Preston,		3·30	2·10	1·			
Leeds and Selby,		2·66	2·00	1·			
Brighton,	2·97	2·37	1·78	1·18	·47	·11	
Croydon,		1·42	1·14	·85			
South Western,	2·87	2·48	1·91		·70	·42	·26
Manchester and Birmingham,	2·47	2·11	1·62	1·	1·12	·77	
Manchester and Leeds,		2·28	2·00	1·	·94	·23	·41
Newcastle and Darlington,	3·23	3·07	2·15	1·	·15	·30	·36
Newcastle and Carlisle,		2·40	1·80	1·			
North Union,		2·45	1·63	1·	·54	·51	·36
Preston & Wyre,		2·52	1·89	1·			
South Eastern,	2·45	2·04	1·36	·82	·48	·28	·10
York and North Midland,		3·00	2·25	1·	·50	·25	1·00

Cattle, Sheep, &c.—The total number of cattle conveyed in the year 1844–5 is nearly two millions. The gross amounts received range as follows:—

London and Birmingham,	£50,000
Great Western,	17,000
Midland, and Bristol and Birmingham,	9,000
Eastern Counties,	5,300
South Western,	4,000
Manchester and Leeds,	4,000
York and North Midland,	3,200
Great North of England,	3,200

Horses.—The number conveyed is as follows:—

Bristol and Birmingham,	2,879
Chester and Birkenhead,	664
Eastern Counties,	2,160
Northern and Eastern,	2,796
Grand Junction,	4,267
Manchester and Birmingham,	785
Great North of England,	2,709
Great Western,	10,504
London and Birmingham,	10,749
London and South Western,	5,570
London and South Eastern,	2,714
London and Brighton,	4,303

Manchester and Leeds,	1,409
Midlands,	9,595
North Union,	989
York and North Midland,	4,197

Coal Traffic.—The following shows the gross tonnage and amounts received on the undermentioned lines in the year beginning 1st July, 1844, and ending 30th June, 1845:—

	Tons.	£
Arbroath and Forfar,	12,000	1,700
Ardrossan,	42,144	2,106
Ballochney,	282,622	3,206
Bristol and Birmingham,	70,000	3,708
Canterbury and Whitstable,	13,000	1,188
Clarence,	300,000	20,000
Dunfermline,	28,477	3,142
Durham and Sunderland,	372,714	22,712
Edinburgh and Dalkeith,	118,340	4,800
Glasgow and Ayr,	120,000	8,000
Glasgow and Garnkirk,	1,761,000	7,600
Great North of England,	181,012	13,079
Hartlepool,	796,486	32,627
Hayle,	20,000	2,400
Leicester and Swannington,	178,566	15,827
Liverpool and Manchester,	133,396	9,414
Llanelly and Llandilo,	92,381	6,067
London and Croydon,	6,000	500
London and South Eastern,	22,519	
London and Brighton,	30,000	2,400
London and South Western,	4,000	
Manchester and Bury,	49,826	3,332
Maryport and Carlisle,	119,375	7,244
Midland,	313,854	42,000
Newcastle and Carlisle,	205,500	19,476
Newcastle and Darlington,	400,000	
Newcastle and North Shields,	26,936	1,198
North Union,	321,923	
Pontop and South Shields,	662,829	49,591
Preston and Wyre,	21,538	4,289
St. Helens and Runcorn Gap,	229,775	9,762
Sheffield and Manchester,	58,668	2,447
Sheffield and Rotherham,	16,000	977
Stockton and Darlington,	900,000	80,000
Taff Vale,	125,986	19,939
Ulster,	807	130
Whitby and Pickering,	1,708	241
Wishaw and Coltness,	390,240	9,969
York and North Midland,	47,529	2,419

Rate per mile for toll only, and for total charges:—

	Toll. d.	Total Charges. d.
Canterbury and Whitstable,		6·00
Dunfermline and Charlestown,		4·29
Bodmin and Wadebridge,		4·25
Hayle,		4·20
Dundee and Newtyle,		3·37
Maryport and Carlisle,	1·16	3·33
Arbroath and Forfar,		3·30
Monkland and Kirkintilloch,		3·00
South Western,		3·00
Wishaw and Coltness,	2·27	2·90
Manchester and Bury,		2·30
London and Croydon,	2·00	2·25
South Eastern,		2·12
Brighton,	·25	2·10
Newcastle and Carlisle,		2·00
Leicester and Swannington,		1·75
Llanelly and Llandilo,	1·00	1·50
Bristol and Birmingham,		1·43
Durham and Sunderland,		1·40
St. Helens and Runcorn Gap,		1·40
Pontop and South Shields,	·75	1·30
Garnkirk and Glasgow,		1·27
Newcastle and Darlington,		1·25
Edinburgh and Dalkeith,		1·25
Preston and Wyre,		1·25
Taff Vale,	·66	1·16
Manchester and Leeds,	1·00	
Clarence,		·91
Hartlepool,	·75	
York and North Midland,		·75
Great North of England,		·50

The above are not in all cases the average charges, but the maximum charges; as, on some lines, a higher rate is charged for going up hill than for going down hill. Ibid.

Canal across the Isthmus of Suez.

We have several times alluded to the grand project of Napoleon of cutting a ship canal across the Isthmus of Suez to join the Mediterranean and the Red Sea—thus intending to destroy British influence in the Eastern Empire. Since the peace, but particularly the establishing of the overland route to India *via* France, Austria, and Belgium, to Alexandria and Suez, by the indefatigable exertions of Lieut. Waghorn, R. N., F. R. A. S. &c., to whom we are indebted for this expeditious communication, monthly, with our possessions in the

East, the subject has attracted the serious attention of the European powers and eminent engineers—but none more so than England. Several plans of a railway across the desert from Grand Cairo to Suez, 84 miles, were proposed, but the laying down of a line on those arid and scorching sands is considered next to impracticable. A ship canal is that which has always been deemed the most successful, as the Nile—from Atfé to Cairo, 120 miles, and Alexandria to Atfé, by the present canal, 44 miles—offers so many facilities to such a stupendous undertaking; but the Viceroy of Egypt has hitherto evinced considerable opposition to a canal or a railway from Alexandria to Suez, although the offers of a *tollage* were very tempting for his coffers. The late visit of his son, Ibrahim Pacha, to this country,—when he inspected our great manufacturing and mining districts, passed over our principal railway lines, and was able to appreciate the splendid steamers from Liverpool to America, from Southampton to the Mediterranean, the West and East Indies, and from the Thames to the north of Europe, showing our national industry and commercial intercourse with all parts of the globe—had a great influence on the talented and searching mind of that Prince. On his return to Egypt, he laid before his discerning father the observations he made during his short sojourn, and how advantageous it would be to the aggrandizement of that flourishing portion of the Levant, if railways and steam navigation were introduced, not only to facilitate the inland traffic, but especially the transit from Alexandria to Suez. The Viceroy has maturely considered the subject, and is now desirous that this great undertaking should be accomplished, and every assistance rendered on his part to carry it out. It appears the British, French, Austrian, and Russian governments have come to an understanding on this important commercial enterprize; and several eminent engineers—English, German, and French—are at present in Paris, concocting the best plans to commence this grand affair, which will be the means of opening to the manufacturing, agricultural, and mining industry of Europe, India, Australia, Van Dieman's Land, and New Zealand, an expeditious intercourse with each other. One of the stipulations on the part of the British government is, that the canal shall not only be made navigable for merchant vessels, but for the largest ships of war and steamers, to which the other powers have agreed. It is proposed to have a regular line of steamboats between Alexandria and Suez, and *vice versa*—so that a communication will be kept up between the Mediterranean and Red Sea, our possessions in India, and in the fifth quarter of the globe. Should this be accomplished, it will be one of the greatest benefits that could have occurred in the annals of commercial and engineering enterprize; and we have very little doubt but that it can be done, considering the advancement made in science within the last half century, and the disposition on the part of all the European powers to encourage industry, and maintain peace, without those national jealousies which have hitherto been the greatest evil to the commercial enterprize and benefit of mankind at large. The joining the South Pacific across the Isthmus of Panama with the Atlantic, by a ship canal, is another of the daring ideas of the present

century, and there is every probability it will ultimately be accomplished by British and French engineers—thereby opening this long-desired communication between the two great oceans.

Lond. Min. Jour.

Cornish Steam Engine Tables.

Table I.

Showing the duty performed by Cornish steam engines for the thirty-three years from 1812 to 1846; also the average and highest duty performed by the best engines in each year.

Years.	Highest Duty Performed.	Name of Mine whose Engine gives highest duty	Average monthly duty of the best Engines.	Average monthly duty of all the Engines reported.	No. Engines reported.	COALS CONSUMED.	
						Av. No. of Bushels of 94 lbs. per month.	Bushel by each Engine per month.
1813	29·76	Stray Park	26·65	19·45	24		
1814	35·00	"	32·00	20·53	29		
1815	34·01	"	30·52	20·52	35		
1816	40·74	Dolcoath	32·04	22·90	32		
1817	44·02	"	41·06	26 50	31		
1818	42·06	"	39·03	25·43	32		
1819	48·05	"	40·00	26·25	37		
1820	48·06	"	41·03	28·73	37		
1821	46·06	"	42·08	28·72	39		
1822	44·16	Consolidated	42·05	28·88	45		
1823	45·98	"	42·12	28·15	45		
1824	46·76	Polgooth	43·05	28·32	45		
1825	53·95	"	45 04	32 00	50		
1826	49·97	Huel Vor	45·02	30·48	48		
1827	67·09	Consolidated	59·67	32·01	47		
1828	87·04	Huel Towan	76·67	37·03	54		
1829	81·99	"	76·23	41·22	52		
1830	77·99	"	75 88	43·35	55		
1831	89·08	"	74·91	44·07	54	81,867	1488
1832	91·35	Huel Vor	79·29	44·04	60	83,480	1346
1833	88·50	"	83·30	46·00	58	88,321	1503
1834	97·85	Fowey Consols	86·25	46·86	57	78,057	1363
1835	95·76	"	91·67	46·45	66	81,979	1225
1836	97·59	"	86·59	45·61	71	101,246	1405
1837	91·98	"	87·08	47·46	70	106,275	1509
1838	91·59	"	84·88	47·84	70	112,631	1566
1839	85·17	Godolphin	82·29	48·88	74	129,801	1740
1840	85·28	Fowey Consols	81·80	49·73	58	203,699	1746
1841	101·71	United Mines	95·23	50·99	51	89,806	1733
1842	107·49	"	99·26	51·62	45	84,862	1848
1843	105·71	"	99·35	55·23	40	72,913	1811
1844	98·72	"	94·89	54·73	35	62,292	1763
1845	96·00	"	91·02	55·64	36	62,148	1715

Table II.

Showing the performances of 12 engines which did the highest duty in October, 1846. The total number of engines reported in that month was 24—the quantity of coals consumed 1884 tons, lifting, in the aggregate, 17,000,000 tons of water 10 fathoms high. The average duty of the whole was, therefore, 51,000,000 lbs. lifted one foot high by the consumption of a bushel of coal.

Mines.	Engines.	Length of stroke.	Load in pounds.	Load per sq. inch on piston.	Strokes pr. minute.	Consumption of coal in bushels.	Millions lbs. lifted 1 foot by consumption of 1 bushel of Coals.	Average quantity of water per minute.
Wh. Prosper	Western, 80-inch	9·7	88,096	14·0	4·6	3024	52·6	997·0
Ditto	Roberts's 70-inch	9·75	73,294	14·7	5·0	2364	58·9	
Great Work	Leed's 60-inch	9·0	47,020	12·9	7·0	2243	52·2	166·0
Carn Brea	Sims's 50, 90 in. combined	9·0	42,291	16·7	3·6	920	59·5	—
Poldice	Sims's 85-inch	10·0	80,475	9·9	5·5	2776	57·2	390·0
Ting-Tang	Sims's 60, 100 in. combined	9·0	56,514	18·8	3·5	1584	54·8	226·0
United Mines	Taylor's 85-inch	11·0	97,108	15·5	5·4	3147	81·1	
Ditto	Eldon's 30-inch	9·0	13,631	16·0	8·2	618	69·2	1149·0
Ditto	Loam's 85-inch	10·0	89,320	11·8	4·8	4825	58·0	
Ditto	Hocking's 85-in.	10·0	99,243	14·8	5·8	4244	57·9	
East W. Rose	Penrose's 70-in.	10·0	47,785	11·1	2·9	1050	60·6	627·0
Ditto	Mitchell's 70 in.	10·0	52,516	12·2	5·1	2250	54·8	

Lond. Mec. Mag.

Dimensions of European Churches.

The *Roman Advertiser* gives the following statistics of the capabilities of St. Peter's, as compared with other great churches; allowing four persons to every quadrate meter (square yard):—

	Persons.	Sq. Yards.
St. Peter's,	54,000	13,500
Milan Cathedral,	37,000	9,250
St. Paul's, at Rome,	32,000	8,000
St. Paul's, at London,	25,600	6,400
St. Petronio, at Bologna,	24,400	6,100
Florence Cathedral,	24,300	6,075
Antwerp Cathedral,	24,000	6,000
St. Sophia's, at Constantinople,	23,000	5,750
St. John's, Lateran,	22,900	5,725
Notre Dame, at Paris,	21,000	5,250
Pisa Cathedral,	13,000	5,250
St. Stephen's, at Vienna,	12,400	3,100
St. Dominic's, at Bologna,	12,000	3,000
St. Peter's, at Bologna,	11,400	2,850
Cathedral of Sienna,	11,000	2,750
St. Mark's, Venice,	7,000	1,750

The piazza of St. Peter's, in its widest limits, allowing 12 persons to the quadrate meter, holds 624,000; allowing four to the same, drawn up in military array, 208,000. In its narrower limits, not comprising the porticos or the piazza rusticci, 474,000 crowded, and 138,000 in military array, to the quadrate meter.

London Athenæum.

AMERICAN PATENTS.

List of American Patents which issued in the month of June, 1846,—with Exemplifications, by CHARLES M. KELLER, *Agent for procuring Patents, and late Chief Examiner of Patents in the U. S. Patent Office.*

1. For an *Improvement in Machinery for Measuring Cloth on the Loom;* Frederic W. Howe, North Chelmsford, Massachusetts, June 6.

Claim.—"I am aware that a roller or cylinder and clock work have been combined, and used for indicating the length of any surface which the said roller or cylinder might be placed and moved in contact with: therefore I do not claim such a combination of mechanism; but that which I do claim as my invention is the combination of the roller or cylinder, and a marking apparatus constructed and applied to it, and operating in conjunction with it, and so as to measure and mark the cloth woven upon the cloth-beam of a loom, substantially in the manner as above specified.

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2. For an *Improvement in the Pen or Pencil Case;* Albert G. Bagley, New York, June 6.

The patentee says,—"The ordinary pen or pencil case is constructed with one tube or barrel, and the holder of the pen or pencil, which slides in and out of it. This contrivance is found to be inconvenient, on account of its length, and the object of my invention is to obtain the same length of pen case, when extended, with the advantage of being not more than one-half of the ordinary length, when closed or slided in. This I effect by making my pen case of two tubes or barrels, one sliding into the other, and the pen or pencil holder to slide within them."

Claim.—"What I claim as my invention, and desire to secure by letters patent, is the mode of shortening the pen or pencil case, by constructing it of two tubes or barrels, one sliding within the other, in the manner herein set forth, in combination with the mode described for sliding the pen or pencil holder within the inner barrel of the pen or pencil case."

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3. For an *Improvement in the Machine for hulling Clover Seed or Rice;* Martin H. Mansfield, Mifflintown, Pennsylvania, June 6.

Claim.—"What I claim as my invention, and desire to secure by letters patent, is the manner in which the projecting rubbers, in the concave, and on the cylinder, are combined and operate with each other, viz: their backs being broad, (either straight or wedge-shaped,) and their roughened sides tapering to a sharp edge at their fronts, are placed in the concave, and on the cylinder, in such a position that the

front edges of the revolving rubbers on the cylinder will pass between the front sharp edges of the rubbers in the concave, the clover seed and rice being hulled by the action of the oblique sides of the rotary rubbers passing between the oblique sides of the stationary rubbers, substantially as herein set forth.

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4. For an *Improvement in Stoves for heating apartments;* Henry Slade, Chelsea, Massachusetts, June 6.

The nature of this improvement consists in applying to the stove a certain combination of eduction flue passages and dampers, by means of which the draught is caused to pass either upwards or downwards, or both upwards and downwards, through the coal or fuel in a state of combustion.

Claim.—"Having thus described my improved stove, what I claim therein, is the combination of the chamber of combustion, and its grate and ash-box, of the two eduction passages and dampers, and two induction passages, and their valves or covers; the whole being arranged and made to operate together substantially as specified."

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5. For an *Improvement in the Method of Impregnating Timber and other porous bodies;* Peter Von Schmidt, Washington, D. C., June 6.

Claim.—"What I claim as my invention, and desire to secure by letters patent, for the purpose of impregnating timber or any other porous substance by any desired fluid, and to encrust or char said wood, in a complete manner, in heated oil, is the following combination of the operations, viz: The steaming of wood in combination of exposing the same immersed in any desired fluid to a vacuum further in combination with the application of high pressure by a hydraulic press pump; and, finally, if required, in combination of charring or encrusting by coal, the impregnated wood in heated oil, as set forth. All these operations are done in one and the same apparatus, as before described in detail in the specification, and illustrated in the drawings. By the different combined actions upon the wood, a perfect impregnation is accomplished, and by the encrusting or charring of the wood in heated oil, the timber so prepared, is more lasting and durable than iron; therefore the combined actions upon the timber, as set forth, have the advantage over all other modes to saturate or kyanize timber which have been practised heretofore.

"I claim the arrangement of the air vacuum, in combination with the funnel, for the purpose and use as set forth."

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6. For an *Improvement in Lamp Burners;* Wm. H. Starr, New York city, June 6.

Claim.—"I do not claim to have invented a new lamp, nor do I claim to have invented any of the parts herein described, nor any ex-

clusive use thereof, irrespective of the manner in which I have constructively combined them for these purposes.

"But I do claim as new, and of my own invention, and desire to secure by letters patent, the constructing lamp-burners, with the slide cylinders, and perforated cylinder, to carry the fixed intermediary capillary wick between them, so that these three parts act in combination to maintain a continuous supply of combustible matter to the burning wick, including the variation shown, and otherwise, substantially as herein described and shown."

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7. For an *Improvement in the Danforth Cap Spinner;* Jacob Peters, Kensington, Philadelphia County, Pennsylvania, June 6.

Under this arrangement, the whirls and bobbins do not traverse up and down with the traverse rails and spindles, but retain their positions as related to the cylinder, or drum, the spindles sliding through the tubes, and through the neck rail and cap, and communicating the traversing motion to the caps only, which rise and fall to distribute the thread upon the bobbins.

Claim.—"Having thus fully described the nature of my improvements in the cap spinner, what I claim therein as new, and desire to secure by letters patent, is the arranging the cap-spindle and bobbins of said machine in the manner herein set forth, by which arrangement the whirls and bobbins are not subjected to the traverse motion, but are merely made to revolve by bands from the cylinder or drum, in the manner set forth, whilst the traversing motion is communicated to the caps alone."

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8. For an *Improvement on the Bat-Wing Burner, for burning gas;* Joseph Battin, Philadelphia, Pennsylvania, June 6.

The patentee says,—"My improvement consists in the particular manner in which I cut two slits in the end of the burner, for the issuing of the inflammable gas, said slits having that relative position which will cause the two broad thin volumes, or sheets of flame produced by the ignited gas, issuing from them, to unite soon after they leave the openings, and to form one combined sheet of flame, the effect of which is, that the amount of light obtained from a given volume of gas is increased nearly or quite one-third."

Claim.—"Having thus fully described the nature of my improvements in the bat-wing gas-burner, what I claim therein as new, and desire to secure by letters patent, is the cutting of two slits in the end of such burner, the relative situation of which slits is to be such as is herein designated; and such as, by their proximity and position, will cause the flames from each slit to unite immediately after their escape therefrom, and form one combined flame; by which arrangement, I obtain the desirable result herein set forth."

9. For an *Instrument called the Saw Dresser, for re-cutting the teeth of saw-mill saws;* Apollos B. Spencer, Newton, Pennsylvania, June 6.

A frame is so formed that it can be clamped to the saw, with a rest or die, that rests against the edge of a tooth, and made adjustable to suit different sizes. A cutting burr is hung in a secondary frame, which slides in the clamped frame, at an angle to correspond with the slope of the teeth, so that by sliding the secondary frame, and rotating the burr, the teeth will be cut.

Claim.—"What I claim as my invention, and desire to secure by letters patent, is the combination of the burr, guided and operated, as herein described, with the movable rest or die, on which the saw rests when cut, and the sliding fastening, for the purpose and use, as a saw dresser, as described in the specification, and illustrated in the drawings."

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10. For an *Improvement in Machinery for Boring and Mortising Hubs;* George Nichols, assignee of J. J. Greenough, Bridgeport, Connecticut, June 13.

The patentee says,—"The nature of my improvement consists in connecting an auger with the carriage on which the hub is fixed, so as to move with it, and bore into the hub at the same time the chisel is mortising; said auger or bit being driven by the same shaft that moves the chisel, so that both operations can be conducted at the same time, by which the work can be greatly facilitated."

Claim.—"Having thus fully described my improvement, what I claim therein as new, and desire to secure by letters patent, is the combination of the mortising and boring apparatus, in the manner and for the purpose set forth."

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11. For an *Improved Brake, for Retarding the Motion of Sleds, Sleighs, &c.;* John Du Bois, Jr., Cascade, Pennsylvania, June 13.

This invention consists in securing the tongue or pole, in the roller, in such a manner as to allow it to play freely inwards and forwards, in a mortise through the same, and, in connecting the tongue to a couple of scrapers placed on the inner sides of each runner—near their middle—so that when the tongue is pressed back, it forces the points of the scrapers against the snow or ice of the road, and thus retards the sleigh.

Claim.—"What I claim as my invention, and desire to secure by letters patent, is the retarding the motion of sleds or sleighs in descending inclinations, by means of self-acting and self-regulating scrapers, attached to the runners, and connected to the tongue of the sled by means of the acute angled elbow, connecting bars, and hammer strap; the whole combined and operating substantially in the manner and for the purpose herein set forth."

12. For an *Improved Parlour Cooking Stove;* Rensselaer D. Granger, Albany, New York, June 13.

Claim.—"I claim locating the pipe communicating from the body of the stove to the elevated oven between the two back boilers, so that its front lower edge shall be contiguous to the fire, *in combination* with the division strips, and the damper, arranged and operating as herein described and shown, viz: so as to form one centre flue beneath the connecting pipe, which flue may be closed at pleasure by the damper, in order to throw the heat through two side flues, and cause it to pass under the rear boilers before it escapes into the connecting pipe.

"I further claim forming the connecting pipe of the horizontal section, herein shown and described: that is to say, having the pipe made broad on its front side, next the fire, for the purpose of obtaining a large capacity of pipe; and also to bring the broadest portion of its section in contiguity with the fire, and accommodate the boilers in the rear."

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13. For an *Improved Plough or Machine for Removing Snow from Rail Road Tracks;* Joseph A. Gregg, Derry, New Hampshire, June 13.

Claim.—"Having thus explained my invention, what I claim as my improvement is the combination of two or more ploughs; that is to say, the arranging two or more ploughs *above* one another, in combination with arranging each plough in advance of the one directly below it, in order that the snow, as it rises, or is thrown from the rear or back part of each mould-board of the inferior plough, may clear itself therefrom, without being obstructed by the mould-board of the plough directly over it; the same being substantially as above set forth."

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14. For an *Improvement in the Self-acting and Self-adjusting Carriage Brake;* Z. C. Robbins, Washington, D. C., June 13.

The patentee says,—"The nature of my invention consists in constructing a carriage brake in such a manner, that, when it is desired to back the carriage, the brake can easily be disconnected from the shafts of the same, and the rubbers prevented from acting on the wheels; and the moment the shafts are drawn forwards, the brake resets itself in its proper position for acting on the wheels at the first hill the carriage descends."

Claim.—"Having thus fully described my self-acting and self-adjusting carriage-brake, what I claim as my invention, and desire to secure by letters patent, is the combination of the draught-shafts, with the brake-shaft, by means of the connecting rod and lever so operating with each other that, by lifting the rear end of the connecting rod, the draught-shafts can be forced back, without acting on the brake-shaft; and when the shafts are drawn forward again, the connecting rod

resets itself, making a perfect connexion between the draught-shafts and brake-shaft, substantially as herein set forth."

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15. For an *Improvement in the Method of Breaking, Fleshing, and Unhairing Hides;* George Welty, West Newton, Pennsylvania, June 13.

The patentee says,—"The nature of my invention and improvement consists in a new mode of working hides by power machinery, instead of hand: that is to say, taking the hides, after being properly soaked, and subjecting them to the action of a series of parallel serrated plates, (for breaking and fleshing the hides,) placed on the periphery of a revolving cylinder, arranged immediately above a revolving drum, for sustaining, raising, and carrying forwards the hides, between the cylinder and drum—the hides being introduced from an inclined table and roller—the effect of said serrated plates being to break and flesh the hides, as they pass between the said cylinder and drum."

Claim.—"What I claim as my invention, and desire to secure by letters patent, is the before described mode of fleshing, unhairing, and scouring hides, and setting sole-leather, as described, by means of the aforesaid combination of the cylinders and drum, arranged and operated in the manner set forth."

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16. For a *Self-acting Carriage Break;* John Du Bois, Jr., Cascade, Pennsylvania, June 13.

The patentee says,—"The nature of my invention consists in extending the hounds, which stay and support the pole of a vehicle, back a sufficient distance beyond the forward wheels of the same, to enable me to secure to the rear ends of the hounds an adjustable sway bar, to each end of which I secure breaks or rubbers. The bar to which the rubbers are attached, is connected to the rear end of the pole by means of levers, &c., in such a manner that, when there is any pressure of the vehicle forward, the horses, in pressing back upon the pole, will press both rubbers uniformly against both forward wheels—the rubbers always acting at right angles with the pole, whether the pole be in a line with the body of the vehicle or otherwise."

Claim.—"Having thus fully described the construction and operation of my self-acting brake, as applied to the forward wheels of wagons, or other four-wheel vehicles, what I claim therein as new, and desire to secure by letters patent, is the placing on the rear ends of the extended hounds, which support the pole, an adjustable movable sway bar, having brakes or rubbers attached to each of its extended ends, in a position to act on the forward wheels of a wagon or carriage when its forward motion is retarded by the pole—the adjustable sway bar being connected to and operated by the pole, by means of connecting rods and levers; the whole combined and operating substantially in the manner and for the purpose herein set forth."

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17. For an *Improvement in the Corn Sheller;* David S. Hollister, Baltimore, Maryland, June 13.

We are under the necessity of omitting the claim, as it refers to, and is wholly dependant on, the drawings, and we do not deem it sufficiently important to justify the publication of them.

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18. For an *Apparatus for Holding the Plates in the Photographic Art;* A. S. Southworth, and J. J. Haws, Boston, Massachusetts, June 13.

This is an apparatus for holding the plates during the process of polishing their surfaces. The plate is held by adjustable plates that project from the surface of the block, about half the thickness of the plate to be polished, so that they gripe and hold the plate by the edges, instead of extending over the edges, as heretofore. The patent, however, is not granted for this, but for the manner of suspending the block, that it may yield to the motions of the polishing instrument; and, as the character of this device is pointed out in the claim with sufficient clearness, we will omit any farther description.

Claim.—"Having thus described our apparatus for holding plates to be polished, what we claim therein as our own invention, and desire to have secured to us by letters patent, is the supporting the plate holder on a bar constructed for holding the same firmly, substantially as herein above described, and suspended by right angular arms, projecting upwards from its ends, and hung upon pivots,, as set forth, so that the top of the plate in the holder will adapt itself, as it were, to the face of the polishing tools when touched by the same, as herein above set forth."

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19. For *Improvements in Machinery for the Manufacture of Cordage;* B. F. Adams, Bristol, Massachusetts, June 13.

The claims cannot be given by reason of their entire dependance on the drawings, which are numerous.

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20. For *Improvements in the Machine for Cutting Book-binders' Boards;* Geo. S. Schofield, Philadelphia, Pennsylvania, June 16.

This machine is for cutting book-binders' boards into strips, by means of two sets of cutter wheels, placed on two shafts, one above the other, so that the boards pass between the two sets to be cut. On each side of these cutter wheels, there is a set of feed rollers, one to take the boards from a feeding table, (provided with a slide, to insure the proper presentation of the boards,) and deliver and force them through between the cutters, and the other set to receive and help to draw them through.

Claim.—"Having thus fully made known the manner in which I construct the machine herein described, I do hereby declare that I do not claim the use of circular cutters, of feeding rollers, or of a feeding table, as in themselves new; but what I do claim as new, and desire to secure by letters patent, is the manner in which I have arranged and combined the respective parts, so as to constitute a new, useful,

and improved machine for the cutting of book-binders' boards, &c., into strips or regular widths—that is to say, I claim the combining of the series of circular cutters with the two pairs of feeding rollers, and with the table—the wheels being arranged and operating substantially in the manner herein set forth."

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21. For *an Improvement in the Method of Securing and Setting the Bit in Hand Planes;* Leonard Bliss, Truxton, New York, June 16.

The bit is secured by an eccentric roller placed in the throat of the plane, just above the bit, and provided with a handle, so that, by turning this, the eccentricity will effectually secure the bit, and avoid the necessity of hammering, as when the wedge is used.

Claim.—"What I claim as my invention, and desire to secure by letters patent, is the method of securing and setting plane irons or bits by means of an eccentric roller extending across the face of the bit, and turning in boxes in the cheeks of the stock, as herein described."

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22. For an *Improvement in the Spring Stirrup;* Abraham Pawling, Philadelphia, Pennsylvania, June 16.

One side of the stirrup is jointed to the lower bar, as in the well-known mode of making spring stirrups, but, instead of depending on the force of the spring alone, to keep this part closed, the spring, which bears up against the underside of the shoulder of the joint, is connected with a piece on the upper surface of the bottom bar, so as to draw it down on to the upper shoulder of the jointed part, which has a rounded notch to receive a corresponding projection on the under surface of the upper piece, so that this rounded catch must be lifted before the stirrup will open.

Claim.—"Having thus fully described the manner in which I combine and arrange the respective parts of my spring safety stirrup, I do hereby declare that I do not claim as new the so forming and connecting one side of the bow of a stirrup with the other parts thereof, as shall allow it to open for the purpose of disengaging the foot therefrom, this having been before done; but what I do claim as new, and desire to secure by letters patent, is the manner in which I have effected this object, by the combined action of the piece, the spring, and the detachable side; these parts being formed and operating substantially as herein fully made known."

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23. For an *Improvement in Spring Mattrasses;* Frederick Forst, Philadelphia, Pennsylvania.

The improvement patented, consists in making the length of the lower frame in two parts, the side pieces of which, where they come together, are sloped down and connected together by strong webbing or other suitable material, and then the covering, properly stuffed, is attached to the upper edge of the two frames, and the connecting

webs or other ligaments, which form the hinges, to admit of bending or turning one half on to the other.

Claim.—"What I claim as my invention, and desire to secure by letters patent, is making the frame to which the springs are attached in two parts, connected together by means of strong webs, straps, or other substances, substantially similar in combination with the mattrass as herein described, whereby mattrasses attached to a frame, and resting on springs, may be folded or turned up for moving them, and for the ease of invalids, as fully described above."

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24. For an *Improvement in the Horse Power:* Jesse Fitzgerald, New York City, June 16.

The horse lever turns on the shaft of the main wheel, and is connected with the wheel to carry it around, by a friction brake, to avoid the breaking of the machinery by any sudden starting of the horse, or sudden stoppage of the machinery. And this brake, which constitutes the ground of the claim, is made in the following manner: The main wheel has cogs on its inner periphery, in which take the cogs of a pinion, the shaft of which passes through the horse beam, and, above the beam, this shaft has a wheel, against the periphery of which friction is made by a strong spring attached to the beam.

Claim.—"What I claim as my invention, and desire to secure by letters patent, is the combination of a pinion and wheel, with the main wheel, for the purpose of producing friction, (by means of a spring, or other pressure,) sufficient to hold partially or entirely the lever in its place, for the object within described.

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25. For an *Improvement in the Lifting Pump;* John Renfrew, Fayette, Pennsylvania, June 16.

The patentee says,—"It is well known that, in the common lifting pump, all the force necessary to lift the column of water, pump-rod, &c., must be exerted during the upward stroke, the return stroke being accomplished by the weight of the rod, &c. This is admitted to be defective. The object of my improvement is to equalize, or nearly, the force required to work the pump, which I effect by attaching a hollow float to the pump-rod, above the piston or pump-box, the buoyancy of which, in the water, will aid in giving the upward stroke, and, from its capacity, will reduce the area of the column to be lifted."

Claim.—"What I claim as my invention, and desire to secure by letters patent, is the employment of a float or air-tight vessel within the barrel of a lifting pump, and attached to the piston rod, for the purpose and in the manner substantially as herein described."

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26. For an *Improvement in the Blacksmith's Tuyere;* Charles W. Grannis, Collins, Erie County, New York, June 16.

Claim.—"What I claim as my invention, and desire to secure by letters patent, is causing the blast to descend, and then ascend, before

leaving the tuyere, by curving the orifice down, and then enlarging it upwards, by which I obtain an elevated blast, and prevent the tuyere from clogging, in combination with a valve placed below the draught, so that on elevating it, the draught will be contracted from below, as hereinbefore specified."

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27. For an *Improvement in the Fanning Mill for Cleaning Grain;* Daniel Clow, Port Byron, New York, June 16.

The screens are connected with the shoe by being let into grooved plates, connected with the side plates of the shoe by adjustable screws, and the two side plates of the shoe are connected together by screw-rods and nuts, for the purpose of securing the screens in place, when put in the grooves.

Claim.—"Having thus fully described the construction and operation of my improvement in the fanning-mill, what I claim therein as new, and desire to secure by letters patent, is the adjustable groove plates, for confining the screens to the sides of the shoe, and, in combination therewith, the manner of securing the screens firmly in any desired position by the rods and screw-nuts, substantially in the manner and for the purpose herein set forth."

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28. For an *Improvement in Suction and Force Pumps;* Samuel K. Sharpe, assignee of F. B. Hyatt, Maysville, Kentucky, June 16.

Claim.—"Having thus fully described my improved pump, what I claim therein as new, and desire to secure by letters patent, is the combination of a forcing and a lifting pump, substantially as herein described, so that the lifting pump can be formed into a surrounding air-chamber for the purpose set forth, by means of a cap valve, by which the top can be made tight without passing the rod through a stuffing-box; the whole being arranged and combined substantially as above specified."

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29. For an *Improvement in the Fabric for Making Ladies' Skirts;* David Hough, Jr., New York, June 16.

Claim.—"Having thus fully described my improvements and their application, what I claim as new, and desire to secure by letters patent, is the employment of bands of sisal or Manilla hemp, with a fabric of cotton or suitable cloth, so as to form a series of horizontal springs around a skirt, while the skirt is left perfectly pliable in its length, and can be washed without removing the bands: constructed and combined in the manner and for the purpose described."

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30. For an *Improvement in the Double Oven Stove;* Wm. Cobb, Albany, New York, June 16.

Claim.—"What I claim as my invention, and desire to secure by letters patent, is the connecting the upper and lower dampers by a lever, in such a manner that, when one damper is opened, the other

will be shut, in combination with two ovens, placed one above the other, with flues between and around them; the whole being arranged and operating as herein described and shown."

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31. For an *Improvement in the Machine for Cleaning Grain;* Frederick A. Stuart, Catharine, New York, June 20.

"This improvement is designed to separate the straw and chaff from the grain, and convey them off together, through a blast of wind from a common winnowing machine, to an inclined spout that conveys it to a receiver."

Claim.—"What I claim as my invention, and desire to secure by letters patent, is the combination of the vibrating shaker, with the inclined swinging trough, as described, and for the purpose set forth."

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32. For a *Machine for Putting Boots and Shoes on the Last;* Silas Hart, New Haven, New York, June 20.

The patentee says,—"The nature of this invention and improvement consists in contracting and expanding the arms containing the jaws for gripping the edges of the upper of the boot or shoe, by means of a slide that embraces or encircles the arms, said arms being moved towards or from the last, simultaneously with the operation of turning the male screw in a female screw, in the centre of the nut, to which they are connected, by which the angle of the arms with the screw is diminished by lasting the upper, and increased in unlasting it, by reversing the operation of the screw; thus removing the objections existing in the use of the machine, where the arms are expanded and contracted by a separate screw, managed at right angles to the main screw, and possessing the advantage of drawing the edges of the leather inward towards the shank, and outward towards the side simultaneously, at the single operation of turning the screw against the last."

Claim.—"What I claim as my invention, and desire to secure by letters patent, is combining the screw and slide with the jaws, in the manner, and for the purpose described.

"I also claim the movable section, in combination with the screw, as described."

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33. For an *Improvement in the Valves of Steam Engines;* H. Olney, J. H. Whelpley, & D. G. Raven, Gouverneur, New York, June 20.

Claim.—"What we claim as our invention, and desire to secure by letters patent, is the method of inducting and educting steam to and from the cylinder of one engine, by means of a hollow piston rod in two parts, connected to and united by a piston, in which are placed induction and eduction slide-valves, operated by thin projecting ends sticking against the heads of the cylinder, as the piston approaches them in performing its reciprocal vibrations—the induction valve being in connexion with one portion of the piston rod, and the educ-

tion valve with the other portion of the same; the whole combined and operating substantially in the manner herein set forth."

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34. For *Machinery for Making Wrought Iron Cannon;* Daniel Treadwell, Cambridge, Massachusetts, June 20.

We are under the necessity of omitting the claims in this instance, as they depend entirely on the drawings; but it is our intention to publish the drawings in a future number, together with so much of the description as may be necessary to a clear understanding of this invention, which is deemed important from the fact that the inventor has made wrought iron cannon for the government, on this plan, that have stood every test to which they could be subjected.

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35. For an *Improvement in the Horse Power, for Driving Machinery;* J. R. Remington, Lowndes County, Alabama, June 20.

This invention may truly be called a horse power, for it consists of an arrangement of parts for whipping the horses, when they do not move fast enough, the mechanism that operates the whips, being governed by a regulator or centrifugal governor.

Claim.—"Having thus fully described my improvements, what I claim therein as new, and for which I desire to secure letters patent, is the employment of my apparatus for whipping or checking the horses, by means of the regulator, substantially in the manner and for the purpose set forth."

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36. For an *Improvement in the Wheat Fan, for Cleaning Grain;* S. M. Yeaman, Elizabethtown, Kentucky, June 20.

The patentee says,—"The nature of my invention consists in dispensing with the shoe used in common fans, and causing each of the riddles to act independently of the others, and in opposite directions, thus equalizing the vibrations, and preventing the machine from choking."

Claim.—"Having thus fully described my invention, what I claim therein as new, and desire to secure by letters patent, is the mode of operating the riddles, sieve, and finger-bars, and combining them with the grain fan, substantially in the manner described, so that each shall move independent of the others, and their motions be antagonistic, while a much greater surface of riddle can be embraced in the same sized machine than is possible in the ordinary mode of construction.

"I also claim, in combination with the above-named parts, the feeding apron, as hereinbefore described."

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37. For an *Improvement in what is known as the "Old Philadelphia," or Ten Plate Stove;* William Shaw, Albany, New York, June 27.

Claim.—"What I claim as my invention, and desire to secure by

letters patent, is the mode of forming and arranging the flues of my stove, as herein set forth and described, viz: by constructing my oven bottom with trough-like depressions or sunk flues, (to be covered with a false bottom,) the part of the plate between said flues serving to radiate directly into the oven the heat generated at the bottom of the fire-grate. Also, the mode of constructing the front oven-plate, with the attached descending flues occupying a part thereof, the remaining portion allowing a direct radiation from the back of the fire-box into the oven; and further, the so constructing the back oven-plate as to form, in connexion with the *false* back, two open flues, with a closed or dumb flue between them, likewise radiating into the oven heat derived from the lower side of the fire-grate; the whole system being, as it were, suspended within the stove, so that the bottom and rear flues, which convey heated air from *above* the fire, are not in any part formed by the exterior plates of the stove, but are separated from them by a stratum of air, heated by radiation from the bottom of the fire-grate."

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38. For an *Improvement in the Filter;* Wm. Bullard, assignee of Royal E. House, New York City, June 27.

This is a filter and cock combined,—the pipe and spout are one, and in the tube thereof there is an oblique partition, with a hole through the pipe on each side of the partition. This part of the pipe is surrounded by a case that is fitted by collars, &c., to turn thereon, and this case is divided into two concentric chambers, by a filtering medium. The water to be filtered, passes along the pipe until it strikes the partition, it then passes through one of the holes, and through a tube to the outer chamber, and, after passing through the filtering medium, into the inner chamber, runs in through the other hole, into the spout on the outer side of the partition. By turning the case on the tube, the supply holes are closed, and the flow of water stopped.

Claim.—"What I claim as my invention, and desire to secure by letters patent, is the combination of the partition pipe with the chambers, by means of the tubes, in the manner and to produce the effect above pointed out."

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39. For an *Improvement in the Straw Carrier, for Separating Grain from Straw;* Russell Tomlinson, Jackson, Michigan, June 27.

Claim.—"What I claim as my invention, and desire to secure by letters patent, is hinging the slats where they are attached to the chain or belts of the straw carrier or separator, by which means the slats are nearly closed when on the upper side, and open when on the under."

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40. For an *Improvement in the Horse Power;* Daniel Cary, Clarkson, New York, June 27.

Claim.—"Having thus fully described the manner in which I con-

struct my horse power, what I claim therein as new, and desire to secure by letters patent, is the special arrangement and combination of the gearing, as herein set forth; said gearing consisting of a single large wheel, driving two pinions, on the shafts of two horizontal wheels, which horizontal wheels gear into two pinions on the line shaft, there being a bridge to admit of the line shaft, the whole arrangement being substantially the same with that herein represented and made known."

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41. For an *Improvement in the Machine for, and in the Method of, Measuring for the Cutting of Garments;* Conrad Kile, Nashville, Ohio, June 27.

We omit the claims in this instance, as they could not be understood without the drawings to which they refer.

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42. For an *Improvement in the Fire Ladder;* James Cox, Brush Valley, Indiana, June 27.

Claim.—"Having thus fully described my improvements, I wish it to be understood that I do not claim a ladder made of sliding sections, nor do I claim mounting said sections on wheels, as these things have been done before; but what I do claim as my invention, and desire to secure by letters patent, is the method of elevating the upper sections, by means of cords attached to them, and to the parts below, so that, by raising the lower movable section by the windlass, each of the sections above shall be drawn out a proportional distance, in the manner, and for the purpose described."

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43. For an *Improvement in the Stove for Heating Apartments;* Saml. Pierce, Peekskill, New York, June 27.

The patentee says,—"The nature of my invention consists in providing the sides of the fire-place with a chamber on each side, provided with apertures to receive atmospheric air from the room, which, after being highly heated by circulation, is discharged in small jets from one of them, through apertures into the fire chamber, above the fuel, to consume the combustible gases evolved from the fire, while in a highly heated state, and from the other, below the grate, to supply heated air for the combustion of the fuel; and also, in combining therewith, a damper or register, to admit cold air under the grate to regulate the combustion."

Claim.—"What I claim as my invention, and desire to secure by letters patent, is combining with the fire chamber of a stove a chamber or chambers, pierced with small holes, to discharge the air that is highly heated in passing through them below and above the fire, for the purpose and in the manner substantially as herein described. And I also claim, in combination with this mode of supplying heated air to the fuel and products of combustion, the damper or register, for admitting cold air to the fuel when desired, to regulate the combustion, as described.

44. For *Improvements in the Kitchen Range;* George E. Waring & Alexander S. Walcott, Stamford, Connecticut, June 27.

Claim.—"Having thus fully described the manner of constructing and arranging the respective parts of the improved kitchen range, what is claimed as new therein, and desired to be secured by letters patent, is the particular manner of arranging and combining the fire chamber, the descending flue in the rear thereof, duly lined as described, and the flue space under the oven, so that the heated air shall operate first on the bottom plate of the oven; also the manner of arranging the partition, and the valve or shutter, so as to compel the heated air, when allowed to pass from the fire chamber to the exit pipe, to operate with its full intensity on the cooking utensils, that are placed in the compartment over the oven; and likewise the employment of the ridges or points on that part of the bottom plate of the range that is immediately under the bottom oven plate, in the manner, and for the purpose set forth."

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45. For an *Improvement in the Winnowing Machine, for Cleaning Grain;* D. A. Church & Smith Church, Friendship, New York, June 27.

Claim.—"What we claim as our invention, and desire to secure by letters patent, is the forming a screen, or series of screens, of thin, broad pieces or strips of wood or metal, united longitudinally and transversely with each other, the upper edges of the longitudinal strips being elevated above the upper edges of the transverse strips, substantially in the manner, and for the purpose set forth."

The object of placing the upper edge of the longitudinal strips above the cross strips, is to prevent the straw and chaff from falling into the spaces between the cross strips, and to furnish straight and smooth ways for the straw to slide on, when acted upon by the blast of wind.

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46. For an *Improvement in the Radiating Stove;* H. D. & J. McK. Fouse, Baltimore, Maryland, June 27.

Claim.—"Having thus fully described our improved radiating stove, what we claim therein as new, and desire to secure by letters patent, is the forming the furnace thereof of two casings, with an ascending flue space between, and the combining the same with the enclosing radiating casing, substantially in the manner, and for the purpose set forth."

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47. For an *Improvement in the Ever Pointed Pencil;* A. G. Bagby, assignee of John Durant, New York City, June 27.

Claim.—"What I claim as my invention, and desire to secure by letters patent, is the mode herein set forth, of forming a bottle or receptacle for surplus leads in the inner cylinder, within which the traveler works, by introducing slips of sheet metal or tubes, to keep the leads from obstructing the passage of the traveler, and to form com-

partments for the leads to be deposited, in combination with a cap, to screw or slide on the end of the cylinder, so as to keep the leads in the compartments."

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48. For an *Improvement on a Machine for Crimping Boot Fronts;* Henry S. Davis, Westernville, New York, June 27.

Instead of griping the leather by the edges, and stretching it, it is scraped or rubbed down, by two jaws that move on each side, the teeth of which are formed at such an angle as to correspond with the general form of the boot mould, so that, in rubbing, the teeth tend to spread out the leather in all directions, and gradually to bring it to the form of the mould.

Claim. "I claim the invention of the teeth or scrapers, as constructed by me, on the inside of the jaws, and conformed exactly to the angle of the jaws and mould."

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49. For *Improvements in the Apparatus for Generating Gas from Rosin or Oily Substances, by the use of Iron Balls;* Amaria Pierce, Philadelphia, Pennsylvania, June 27.

Claim.—"What I claim as my invention, and desire to secure by letters patent, is the combination, use, and arrangement of two retorts, one in the inside of the other, fastened and secured as described, for the purpose to generate gas from rosin, or any other oily substance, as set forth; which rosin or oily substance is introduced in the space between the heated (large) retort and the inside heating retort, as described in the specification, and represented in the drawing.

"I claim the use and combined arrangement to keep up a constant and uninterrupted current of water through the condensers, for the purpose of cooling and condensing the gas, which is arranged in the following manner: The supply barrel is supplied by the pump, from the reservoir; the current of water passes through the supply barrel into the worm-shaped gas cooler, through the supply pipe, and then through the warm water pipe, into the first coolers; and, lastly, returning the heated water by the return pipes, again into the reservoir, to renew the circulation, as described in the specification.

"I claim the combining the armature or jacket with the retort, in the manner described, for the purpose to enclose and secure the lower parts of the large retort from the destructive action of the fire. I claim the arrangement of the tar trap, being in the inside of the tar chest, attached to the lower extremity of the conducting gas pipe, for the use and purpose as described above."

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50. For a *Vent Plug or Cork, for bottles and other vessels containing fermenting liquids;* M. Vasser, Poughkeepsie, New York, June 27.

The patentee says,—"It is known that vessels containing fermenting liquors frequently burst, from the great pressure of the gases gene-

rated by the fermentation within, and, with the view to prevent this, I have invented a vent plug, or stopper, (to be applied to all such vessels,) provided with a cap that covers the aperture or vent, which cap is connected and held down by means of a strip or strips, or threads of India rubber, attached to the lower end of the plug or stopper, and passing up through the aperture thereof, so that the vent is kept air-tight by the tension of the India rubber, until the pressure of the gases within becomes so great as to endanger the safety of the vessel, and superior to the tension of the India rubber, when the cap is lifted by the escaping gases, to relieve the vessel, and then closed again. And, as the cap cannot be opened, until the pressure of the gases becomes greater than that of the atmosphere, added to the tension of the India rubber, it is evident that atmospheric air cannot enter, to vitiate the liquid."

Claim.—"What I claim as my invention, and desire to secure by letters patent, is the spring cap, in combination with the vent-plug or stopper, as herein described."

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51. For *Improvements in Power Looms;* Warren Dutcher, Bennington, Vermont, June 27.

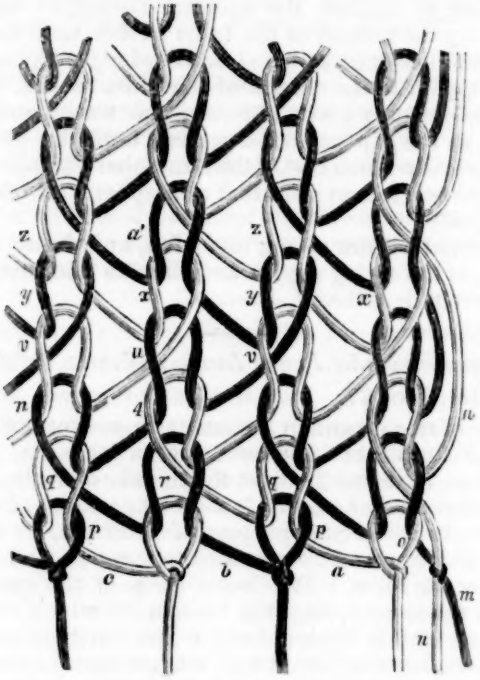
The nature of this invention "consists in connecting each driving shaft with the shuttle box, by means of a joint-link, jointed to the shuttle box, and to the staff, about the middle of its length; the staff also rests against a roller near its lower end, to admit of its moving up and down, and to answer the purpose of a fulcrum, for drawing back the staff, by means of a strap attached to a spring, and to the end of the staff below the roller. The lower ends of the two staffs being connected by the same spring, the tension of which is so regulated, that, when one staff is thrown back, it has strength enough only to carry back the other staff about half way, where it remains until the shuttle is driven back, which distends the spring and causes this staff to move back, as the shuttle reaches it, and which, therefore, gradually arrests it."

Claim.—"What I claim as my invention, and desire to secure by letters patent, is combining the driving or wag staffs with the shuttle boxes, by means of the joint-links, as herein described, for the purpose of causing the end that drives the shuttle without a picker, to move parallel with the race board, or nearly so, during its vibration, substantially as described.

"And I also claim connecting the lower end of the two staffs below their fulcra, by means of a spring having an intermittent action for drawing them back, in combination with the application of a positive motion above, for driving the shuttle, whereby the returning staff aids in arresting the momentum of the shuttle, substantially as herein described."

52. For an *Improvement in Warp Net Fabrics;* James S. Glover, Ipswich, Massachusetts, June 27.

The accompanying drawing, together with the claim, will give a perfectly clear notion of this fabric to the reader.



Claim.—"Having thus fully described my invention, that which I claim is the above specified mode of looping and interlooping, or interweaving, the several warp threads in opposite directions: that is to say, the advancing each thread towards the left and looping it twice, and passing each of the loops so formed through loops of the adjacent thread on the left; then reversing the direction of each thread, or carrying it towards the right, and forming two more loops upon it, and introducing said loops respectively through two loops of the thread immediately adjacent on the right, and so on throughout the whole fabric to be woven.

"I also claim the above described manner of forming the selvages, or combining or uniting the selvage threads with one another, and the main warp threads, the same being represented in the drawing."

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53. For a *Machine for Weaving Nets;* James McMullen, Baltimore, Maryland, June 27.

This machine, from the very nature of the operation it is intended to perform, is very complex, and the mechanism intricate. The draw-

ings are numerous, and the specification covers some sixteen folio pages; and, as the claims refer to, and could not be understood without, the drawings, we are under the necessity of omitting them. We will endeavor shortly to condense the description and drawings, to give our readers some notion of this ingenious piece of mechanism."

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54. For an *Improvement in the Method of Making Ploughs by Swedging;* Harvey H. May, Galesburg, Illinois, June 27.

The patentee says,—"The nature of my invention consists in forming mould boards, shares, ties, (to connect the mould board and share,) and plough posts or standards, by means of a press, having dies or swedges, (one set for right hand, and one set for left hand ploughs,) in which the mould board, the share, the ties, and the post, have their place, and are adjusted by perpendicular rods, while being formed. To facilitate the fitting and putting together the plough, I make the upper die stationary in the press, while the lower die is movable, and is elevated with great force, causing the part of the plough in the press to conform to the upper die. The upper die I call the *mould*, and the lower one I call the *follower*."

Claim.—"What I claim as my invention, and desire to secure by letters patent, is the method of forming mould boards, shares, ties, plough posts, (or standards,) of wrought ploughs, by means of dies or swedges, (mould or follower,) in combination with rods or projections to determine the appropriate position of each piece in the press while being formed, as herein described."

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55. For a *Machine for Weighing, Packing, and Pressing;* Gilbert D. Jones, New York, June 27.

This invention is for the purpose of weighing, packing, and pressing spices, coffee, drugs, flour, and other materials which are usually put up in packages.

The patentee says,—"The prominent features of this machine consist, first, of means to convey the spices into a 'counter balance scales,' which are so contrived, by the balance end of the latter being connected with a cord, which passes over a pulley, to the sliding door of a hopper, as to admit of any weight of spices that may be required for the ordinary description of packages used in business. Second, the mode of dumping the spices from the scales into the package paper, which has been previously folded and sealed at one end. Third, an endless chain of moulds, of suitable form and dimensions, to receive the package paper. By the horizontal movement of this endless chain, the packages in the moulds are successively brought to their respective places, to receive the spices from the 'counter balance scales,' to be packed and pressed, and, finally, in a finished shape and condition, ejected from the moulds, into a basket or receiver."

Claim.—"What I claim as my invention, and desire to secure by letters patent, is the endless chain of moulds, open at both ends, and stationary bed plate, combined with the succession of differently formed presses or pistons."

Improvements added to existing Patents in the month of June, 1846.

1. Lucius Stebbins, Hartford, Connecticut, June 16. Improvement added to letters patent granted to him on the 12th of March, 1840, for a *Machine for Coloring Maps, Charts, or other Prints.*

For a description of the original, the reader is referred to this journal, vol. 1, third series, page 332.

Claim.—"Having thus fully described the nature of my additional improvements in the apparatus for coloring maps and prints, what I claim therein as new, and desire to secure by letters patent, is the attaching the stencil plates or theorems to a wheel or reel, in such a manner as that they may revolve vertically, and pass over and under the table upon which the map or print is placed, substantially as herein fully made known, the apparatus remaining in all other respects the same with that described in the specification to which this is supplementary."

List of American Patents which issued in the month of May, 1842, *with Exemplifications, by* CHARLES M. KELLER, *late Chief Examiner of Patents in the U. S. Patent Office.*

1. For an *Improvement in the Method of Disconnecting Horses from Carriages;* George Kintzi, Exeter, Pennsylvania, May 4.

The patentee says,—"The nature of my invention consists in providing the back plate part of a swingle tree with springs, whose thinner ends come to lay in about the centre of said tree, under a turning plate, the turning of which permits the escape of the springs from over the swingle tree, and liberate it."

Claim.—"What I claim as my invention, is the mode herein described, of releasing horses from a carriage, by means of the springs which are connected with the swingle tree, by the turning plate, as described."

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2. For an *Improved Mode of Applying the Escape Steam of Steam Engines to Distilleries, Propelling Machinery, &c.;* Geo. & Geo. W. Davis, Canal Fulton, Ohio, May 4.

The patentees say,—"The nature of this invention and improvement consists in combining and arranging certain plates, valve seat, valves, and valve box, in such a manner as to produce an apparatus, to be applied to the steam cylinder of an engine, instead of the usual escape pipe, by which the main body of the steam may be applied to various useful purposes, without producing any reaction or resistance on the piston, by the steam which remains in the cylinder, after the main body of the steam has been let off, and applied to the above mentioned purposes."

Claim.—"We do not claim applying the escape steam of the steam

engine to any particular purpose, but that which we do claim, is the before described method of applying the main body of the escape steam of the engine to useful purposes, and then conducting the remaining portion of said escape steam to the condenser, or into the air, to prevent resistance to the piston in the cylinder, which is thus rendered entirely clear of all obstruction, in the manner herein set forth, or in any other mode substantially the same."

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3. For an *Improvement in the Churn;* Roderick Goodwin, North Bergen, New York, May 4.

Claim.—"What I claim as my invention, and a useful improvement in said machine, is the shape, position, and arrangement, and relative situation of said floats, so attached to said arm as aforesaid, and as proposed to be used in connexion with the rest of said machine; by which, when it is in operation, a gyratory motion of the fluid to be acted on inside the churn, is prevented, it being thrown inwardly towards the said lower shaft, by the first mentioned float, and, by the second, back towards the sides of the churn, and the volume passed between those two constantly divided in the middle, and thrown each way, by the obtuse angle of the float thirdly above mentioned, and every part of the fluid rapidly stirred, and exposed to the action of the air, admitted through the aperture in the lids around the lower shaft, and the process of making butter from cream facilitated and shortened, while none of it is thrown out at the top by the revolving of said floats."

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4. For an *Improvement in the Lard Lamp;* B. K. Maltby, of Rootstown, & Jesse Neal, of Middlebury, Ohio, May 4.

Claim.—"What we claim as our invention, and desire to secure by letters patent, is the construction and use of a wick tube, closed at the bottom, and perforated with numerous openings through its sides, to admit the lard to the wick, and, at the same time, prevent the wick from being displaced or crowded up from below, in combination with the above described lamp, for forcing up the lard, or any other acting on similar principles."

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5. For a *Machine for Cross Napping Cloth;* John Taylor & John Smith, New Lebanon, New York, May 4.

The cloth passes under two rollers, and between these a cylinder, covered with cards, operates, to raise the nap across the cloth.

The claim is limited to the cross napper, in combination with the two rollers for cross napping.

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6. For an *Improvement in the Horizontal Percussion, and Reaction Water Wheel;* Saml. Diehl, Manallen, Pennsylvania, May 4.

Without a drawing, we could not give a clear description of the improvements claimed.

7. For an *Improvement in the Cooking Stove;* Anson Atwood, Troy, New York, May 4.

Claim.—"What I claim as new, and desire to secure by letters patent, is the particular manner in which I have arranged and combined the flue spaces, so that the draught from the fire shall first pass around three sides of the posterior part of the oven, and then around three sides of the anterior part, as herein set forth. I also claim the manner of supplying heated air to an oven, by admitting air from the room, through an opening in the rear end of the bottom plate, into the air heating compartment, and thence into the oven, through an opening in the fore end of the bottom plate of the oven; the respective parts being arranged substantially in the manner set forth."

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8. For an *Improvement in Cotton Gins;* F. J. James, Princeton, Mississippi, May 7.

There is a small rotary brush that acts on the fibres, to clean them before they reach the usual stripping brush, and, below, there is a stationary brush for the final stripping of the fibres, and a plate, with slats, through which the saws pass, to prevent the action of the currents of air on the fibres as they approach the stripping brush.

Claim.—"What I claim as my invention, and which I desire to secure by letters patent, is the employment of the additional brush, and the stationary brush, in combination with the saws of the saw gin, in the manner described; and also the plate, in combination with the brush and saws, as described, for the purpose of cleaning the cotton of dust and trash, whilst undergoing the process of ginning, whether arranged in the precise manner before described, or in any other mode substantially the same."

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9. For an *Improved Pin for Fastening Shawls, Diapers, &c.;* Thos. Woodward, Brooklyn, New York, May 7.

Claim.—"What I claim as new, and desire to secure by letters patent, is the combining of a concavo-convex shield, which is bent or recurved at its ends, with a pin that is secured thereto, by an eye or loop, at one end, and the point of which is to pass into, and be retained by the hollow in the recurved part of the opposite end, in the manner and for the purpose herein fully set forth."

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10. For an *Improvement in the Door Latch;* Geo. E. Sellers, Cincinnati, Ohio, May 7.

Claim.—"What I claim as new, and desire to secure by letters patent, is the manner in which I have formed and arranged the weight, and combined it with the other parts, by means of which the bolt is forced out, as set forth: that is to say, a weight, the operation of which is the same in either of the two directions, in which the latch may be affixed to the door."

11. For an *Improvement in the Press for Pressing Cotton;* Samuel Fry, New York, May 7.

Claim.—"What I claim as my invention, and desire to secure by letters patent, is the use of the chain and fusee, in connexion with the jointed levers, in the manner above described, or by any combination of those parts essentially the same, by which a continuous motion is given to the platen, with such increase of power as may be required."

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12. For an *Improvement in the Construction of Iron Vessels;* James Kerr, Wm. Grant, & John Potter, Pittsburg, Pennsylvania, May 7.

Claim.—"What we claim as our invention, and desire to secure by letters patent, is the lining iron vessels used in navigation, between the ribs, with metal, so as to form water tight chambers all around the sides, in the manner and for the purpose above described."

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13. For an *Improvement in the Sleigh;* T. R. Timby, Auburn, New York, May 7.

Claim.—"What I claim as my invention, and which I desire to secure by letters patent, is placing the box or body on an axle or balance rod, in combination with one or more springs, arranged under the body, in the above described manner, or in any other substantially the same."

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14. For *Improvements in the Machine for Cutting Shingles;* D. M. Cummings, East Lebanon, New Hampshire, May 7.

Claim.—"What I claim as constituting my invention, and desire to secure by letters patent, is the particular manner in which I have combined and arranged the respective parts of my machine, as above described: that is to say, I claim the combining of the stationary horizontal table, having eight openings or boxes, more or less, with the revolving table, furnished with two knives, so located, as that only one shall be in action at any one time, and on such angles as will enable them to commence and cut the thin end of each shingle, of the above dimension, off, before the cutter begins on the thick end, and with the system of weighted levers, for holding the blocks in their places; the whole being formed and operating substantially as herein set forth."

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15. For an *Improvement in Saw Mills;* Saml. Darling, 2nd, Groton, Vermont, May 7.

Claim.—"What I claim as my invention, and desire to secure by letters patent, is, first, the arranging of the respective friction rollers, in the boxes or recesses within which they are contained, in such manner as that they shall, at every descent, be acted on by springs and cushions in the lower part of said recesses, in the manner, and for the purpose set forth. I claim, also, the manner of arranging and combining the vertical timbers, which I have denominated false

cheeks, so that they may rock or vibrate to the required extent; and so that they, with the friction rollers, shall be kept up to their bearings, by means of springs and wedges, operating substantially in the manner herein described. I claim, likewise, the manner in which I have combined twelve, or more, friction rollers, with a saw frame and fender posts, through the intermedium of false cheeks, which have a vibrating or rocking motion, and which are borne up against the saw frame by the action of springs; the general arrangement and combination of the respective parts of the whole apparatus being the same, or substantially the same, with that herein fully described and made known."

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16. For an *Improvement in the take-up and let-off motions of Power Looms;* B. W. & H. Hendrick, Woonsocket Falls, Rhode Island, May 12.

Claim.—"What we claim herein as new, and desire to secure by letters patent, is the manner in which we have combined the two worm wheels, with the yarn and the cloth beams, one of said wheels having a right handed, and the other a left handed thread, so as to cause them, by their counter action, to preserve the two beams in their required relative positions, without the aid of a friction band, or any analogous device. We claim, likewise, the manner in which we have arranged and combined the worm wheel, the shaft, the spiral spring, the clutch wheels, and the cloth beam, so as to admit of the yielding of the latter, with the varying tension of the warp."

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17. For an *Improvement in the Bee Hive;* Frederick Wolfersberger, Plymouth, Ohio, May 12.

Claim.—"What I claim as my invention, and desire to secure by letters patent, is the combination of the slides with the small drawers, perforated at the top, with holes corresponding to the plug holes; said slides being used in connexion with said drawers and plug holes, for the purpose of smoking and driving the bees from the boxes, to secure honey, without injuring the bees; using for that purpose, any metallic, or other substance, which will produce the intended effect."

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18. For an *Improved Mode of Multiplying and Equalizing Swarms of Bees;* James Jones, Galway, New York, May 12.

The patentee says,—"The nature of my invention consists in the construction of a bee hive of two equal and distinct parts, which, when joined together, form one complete, enabling the apiarian to form two hives, of one full and one empty hive, by taking apart the two halves, and adapting to each other a full, and an empty half; thus forming of one swarm, two swarms of bees, which will continue their labors in each, as well as swarms produced by the natural process of swarming; and which may be continued through the swarming season, as often as they are full."

Claim.—"What I claim as my invention and improvement, and desire to secure by letters patent, is the adapting together two halves of a hive, constructed according to the above specification, or in any similar convenient form, so that the same may be taken apart, and adapted to, and connected with, an empty half of a hive, for the purpose of separating one swarm of bees, and their honey or products, into two, to prevent the trouble and risk of their swarming, and the injury or loss of the bees."

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19. For a *Machine for Making Bricks;* Antoine Carbonel, Philadelphia, Pennsylvania, May 12.

The claim refers to, and is dependent on, the drawings, and we therefore omit it; but it is limited to the combination of the eccentrics, and pistons with the toggle joints, by means of which the brick is pressed at the same time from opposite sides, and then discharged.

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20. For an *Improvement in the Mode of Altering the Set of Iron Ploughs;* Nathan Hull, De Kalb, Mississippi, May 12.

Claim.—"What I claim as my invention, and desire to secure by letters patent, is the application of this braced frame to the use and purpose of altering the mode of setting iron ploughs, to and from land. The remaining portions I hereby disclaim."

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21. For a *Door Lock, called the Quadrant Bolt Combined Lock and Latch;* G. E. Sellers, assigned to Miles Greenwood, Cincinnati, Ohio, May 12.

Claim.—"I do not claim to be the first to have substituted a gravitating weight for the springs, usually employed for forcing the latch bolt forward, this being a device well known; but what I do claim, as constituting my invention, is the particular manner in which I have arranged and combined the quadrant bolt, the tumbler, and the turn-buckle or cam, so as, by said arrangement and combination, to cause the quadrant bolt to be acted upon by the key, by the turn-buckle, and the tumbler, substantially as herein set forth and made known."

BIBLIOGRAPHICAL NOTICES.

Hunt's Merchants' Magazine, and Commercial Review. FREEMAN HUNT, Editor and Proprietor. Published monthly, at 142 Fulton Street, New York.

This well-conducted journal, published in the great commercial emporium of the Union, and specially devoted to subjects connected with Commerce, Manufactures, and Political Economy, must be a welcome monthly visiter to the counting house of the man of business. But

not only to the merchant and manufacturer is it valuable and instructive; for such is the varied nature of its contents, and so expansive the scope of its design, that the engineer, the artisan, the agriculturist, the statesman, the political economist, and the general reader, will find in its pages much that relates to the productions, manufactures, resources, improvements, revenue, and general statistics of our country, tending to illustrate the general progress, and specific details of our business operations, and industrial pursuits.

We regard every publication which tends to develop, encourage, and give a proper direction to the productive industry of our country, whether commercial, manufacturing, or agricultural, as a public benefit; and journals of this kind, when conducted with ability and impartiality—not to subserve local or individual interests, but for the purpose of disseminating authentic facts, and reliable information for the common good,—are worthy of substantial encouragement. In our widely spread, and industrious community, though each individual may, in his particular sphere of business, conduct his concerns with commendable diligence, and to his own particular advantage; yet how greatly is enterprise stimulated, industry strengthened, and the common welfare promoted, by the general diffusion of correct information, concerning the various changes, modifications, and improvements which are constantly taking place in our business relations;—and how interesting are statements concerning the operations in particular branches, or the aggregate amount of business, trade, product, or labor, for particular places, or for stated periods.

The matter contained in each number of this Magazine, is arranged under the following appropriate general heads: 1. Original and Selected Articles upon subjects connected with Commerce, Manufactures, Internal Improvements, and other general topics. 2. Mercantile Law Cases. 3. Commercial Chronicle and Review. 4. Mercantile Miscellanies. 5. Commercial Regulations in this and foreign countries. 6. Nautical Intelligence. 7. Railroad, Canal, and Steamboat Statistics. 8. Commercial Statistics. 9. Journal of Mining and Manufactures. 10. Journal of Banking, Currency, and Finance. 11. Notices of New Publications.

Many of the original articles are well written, and display a thorough acquaintance with the subject discussed. We are gratified to observe, in the number for June, an able paper by our fellow-citizen, Col. C. G. Childs, on the Iron Trade of Europe and the United States, with special reference to the Iron Trade of Pennsylvania. Such articles as this, and a number of others, which have appeared in the pages of the Merchants' Magazine, are not only creditable to the ability and research of the writers, but have a direct tendency to promote the best interests of our country, by imparting a just view of the extent and importance of our resources, and a knowledge of the proper means for making them available for our advantage.

The pages of this magazine present a body of statistical information, which is invaluable for purposes of reference and comparison. It is to be regretted, that, among a people so energetic, enterprising, and productive, as those of the United States, more attention has not

been given to collecting and preserving *accurate* statistical accounts of our business transactions, and industrial operations, as connected with commerce, arts, manufactures, and agriculture. Our decennial census, if correctly taken, would supply, at rather remote periods, much useful information in this respect; but experience has shown that, as heretofore managed, the returns are, too generally, such, that little reliance can be placed upon their accuracy. Until more care shall be exercised in the taking of this census, or the business confided to more careful and competent agents, than some who have been employed for that purpose, we shall in vain look to this source, for reliable statistical knowledge concerning our country.

In our great commercial cities, where the population is dense, and business concentrated, peculiar facilities exist for obtaining a complete account of the number of inhabitants, buildings, improvements, trade, products of labor, amount of business, valuation, &c., &c. Boston, with her characteristic enterprise, has already taken the lead in this matter, as in some others of a commendable nature. The census of that city, taken under the authority of its Council, in 1845, and published in a volume of nearly 300 pages, embraces a most valuable account of the population, progressive wealth, commerce, manufactures, valuation, finances, public institutions, buildings, &c., with statistics of the different classes of population, their domestic condition, education, health, pauperism, crime, and various other subjects of interest, relating to the history and condition of the community of Boston, and their means of progress and prosperity.

A movement has also been made towards a similar undertaking, in the City Councils of Philadelphia, and this laudable project, we believe, is only delayed, with a view of obtaining the co-operation of the adjoining corporate districts, which, although not included within the *city proper*, yet constitute about two-thirds of what is popularly known as Philadelphia. A complete statistical census of the city and districts, which, in fact, all belong to the same great municipality, is, at this time, very desirable, as a means of properly knowing and estimating the vast manufacturing, artistic, commercial, and other productive resources of Philadelphia; but, to be complete, or, indeed, in any considerable degree satisfactory or useful, it must include both *city* and *districts*. By the adoption of a properly matured plan, and the employment of a few active and competent persons to collect the requisite information, a complete statistical census of Philadelphia might be taken, at an expense so small as to appear trifling, when compared with the benefits which would result from a successful completion of the undertaking. We earnestly hope that this subject will be favorably considered by the corporate authorities of the city and districts, and that, by carrying the design into effect, a fund of valuable knowledge will be acquired, concerning the present condition of Philadelphia, her productive industry, progressive wealth, and elements of future prosperity, which will prove advantageous to her interests, both at home and abroad. **T.**

De Bow's Commercial Review of the South and West; a Monthly Journal of Trade, Commerce, Commercial Polity, Agriculture, Manufactures, Internal Improvements, and General Literature. New Orleans. J. B. De Bow, Editor and Proprietor.

The rapidly increasing spirit of enterprise and improvement, now so vigorously manifest in the Southern and Western States, is ably seconded and supported by this valuable Journal, which, itself, bears marks, since its first establishment, in 1846, of great improvement, both in matter and mechanical execution. From its present appearance, we should judge that the enterprising publisher has not been mistaken, in supposing that "the wants of the South demanded such a Journal,"—and that the people of the wide and fertile region, to whose interests it is mainly devoted, are disposed to encourage a publication, calculated to develop the inexhaustible resources, exhibit the statistics, advocate the policy, and promote the prosperity of that important section of the Union.

Among the interesting and instructive articles, which we have particularly noticed in several numbers of this Journal, may be mentioned, several on the Culture and Manufacture of Sugar in Louisiana; on Southern and Western Agriculture; Notes on the Geology of Alabama and the Mississippi Valley; on the Climate and Diseases of the South; on Domestic Manufactures in the South and West; on Cotton and Cotton Planters; Sketches of the Ouachita and Plaquemines regions; on the Progress of American Commerce; on the Mississippi, its Sources, Mouth, and Valley; on Mexico, and the Trade with that country; as well as many others, replete with valuable information. The subjects of American and Foreign Commerce, Agriculture, Statistics of Cities, Internal Improvements, Manufactures, and matters generally, relating to Trade and Commerce, receive a due share of attention.

We regard the Commercial Review as a valuable and important auxiliary to those publications, which have for their object, the promotion of the business interests of our common country; and particularly so, as it is mainly devoted to a region, the growing importance of whose trade and productions, renders information concerning its progress and statistics, more interesting and desirable from year to year. T.

FRANKLIN INSTITUTE.

Use of Anthracite Coal in Locomotives.

At the monthly meeting of the Franklin Institute, held June 17th, 1847, the following remarks on the use of Anthracite in Locomotives, were made by Professor W. R. Johnson.

Since the attainment of so complete a success, in using anthracite under the boilers of stationary engines, and on board of all our prin-

cipal river and sound steam vessels, on the Atlantic coast, it has become a subject of much inquiry, to determine why so little success has attended the efforts to introduce it into general use upon railroads. Various trials, on the Columbia Road, and others on the Reading Road, have, it is understood, been attended with so little promise of advantage, as to cause, at present, the abandonment of that fuel, and an adherence to wood, as the only available material. The cost of wood, alone, to the Reading Railroad, during the last year, is put down, in the late annual report, at $202,061, and, as the total quantity of coal brought to market, over the road, was 1,188,258 gross tons, we have, after deducting the wood required for passenger and freight trains, an expense of $191,569, for the wood required to haul that quantity of coal 94 miles, and to take back the empty cars. It is true, that the whole of this coal did not reach tide-water, but the computation is based upon the fact, stated in the report of the Company, that the cost of wood, "per round trip of 188 miles," to haul 360 tons of coal, the above distance, and "back with empty cars," was 14·92 cords, costing $58·04. It is estimated, by the President of the Railroad Company, that the introduction of anthracite, instead of wood, would save the company $125,000 per annum. Should it save half this sum, it is evident that great outlays, to effect the purpose, would be warranted, and, consequently, the efforts heretofore made would be fully justified. Mr. Nichols, the engineer, and general superintendent of the Reading Road, has been, for some time, engaged in an effort to accomplish this object, by placing the engine and boiler on separate carriages, with a view to an enlargement of the fire surface of the latter. Mr. N. has, in fact, used an ordinary locomotive, to which he has attached, on a separate truck, a boiler, 16 feet long, and 4½ feet wide, with a semi-cylindrical arch running the whole length. This is connected, by jointed pipes, with the engine. The blast is created by a fan, driven by a small engine. The escape steam is thrown into what was the original boiler of the locomotive engine, which is still retained, for the double purpose of serving as a *condenser*, and of making weight on the driving wheels. If this plan of condensation shall be found available, much time will be saved which is now consumed at water stations, as a large portion of the water will be constantly circulating.

So important to the Reading Railroad, has this item of expenditure of *fuel* become, that, during the past year, efforts have been made by the company to manufacture an artificial fuel, with a basis of anthracite, as a substitute for wood. In this, they are understood to have so far succeeded, as to have made some trips with it. But still the desideratum is the use of anthracite alone.

Having several times, within seven or eight years, witnessed the exclusive use of anthracite, in all the locomotives on the Beaver Meadow, and Hazleton Railroads, making round trips of thirty or forty miles, I have felt much interest in tracing the causes of ill success elsewhere.

From all the inquiries which I have been able to make, the follow-

ing appear to be regarded as the chief impediments to the use of anthracite in locomotives.

1. The want of rapid ignition, and free, lively combustion.

2. The intense, concentrated, local heat, which is said to destroy the grate bars, to attack the rivets and laps of the fire box, and even to cause blisters to rise in the plates of which it is composed; and, finally, to fuse the ashes into a troublesome clinker.

3. The sharp, angular particles of coal, projected by the violent, fitful blast of the escape-steam, obliquely into the ends of *copper* tubes, cuts them away within a few inches of the fire end. In the upper range of tubes, it is the upper side which is chiefly attacked, and, as might be anticipated, in the lower ranges, the lower sides are most worn away. The effect of this cutting is usually limited to four or six inches of the length of the tubes.

4. The difficulty of fitting in iron tubes, so as to make perfect joints, and, at the same time, avoid irregularity in the form of the heads, and loosening one tube while another is fastened.

As the first of the above difficulties, the want of proper activity in the fire, has been completely overcome in our steamboats, by the use of a steady fan blast, it seems that an equivalent blast in the locomotive ought to produce the same effect. The irregular, fitful current, generated by the waste steam, is not in all respects an equivalent to the blast of a fan, but when that blast is equalized, by projecting the escape steam, first into a receptacle of considerable magnitude, and then through a number of small pipes, equally distributed over the area of the chimney, the blast is so nearly equable, as to answer completely the purpose of sustaining the fire in brisk and uniform activity. This method of disposing of the escaping steam, originally invented by Mr. Gurney, and applied in common road engines, to prevent the frightening of horses, by the sudden, violent belching sound, was first introduced here by Mr. Hopkins Thomas, now of Beaver Meadow, while a workman in the employ of Messrs. Eastwick & Harrison. His object was a steady blast, not the mere avoidance of disagreeable noise.

The steam box used to equalize the draught, is cylindrical, 12 inches in diameter, and 11 inches deep; two tubes, each three inches in diameter, flanched at the opposite ends to the steam chests of the two cylinders of the locomotive, support the box in the interior of the dust chamber, and convey the escape steam to its centre. A lid, ground to fit the top of the steam box, has 18 jet pipes, rising two or three inches from its upper surface, drawn in at the top to a diameter of half an inch. These are placed just beneath the base of the chimney, and their purpose is to distribute the escaping steam throughout the chimney, and, by limiting, to some extent, the rapidity of flow, to maintain within the box a pressure *approaching* to uniformity.

Messrs. Eastwick & Harrison founded, on a division of the receptacle into two parts, a patent, which they applied in some engines built by themselves. But as this evidently tended to make the action of the steam upon the air of the chimney, in a degree partial and fitful again, the Beaver Meadow and Hazleton Companies discarded

this modification of Gurney's plan, and in all their engines, which have constantly used anthracite for the last eight or nine years, the draught is ample, the combustion regular, and the evaporation vigorous and well sustained. The fire is, of course, *kindled* with wood, and when this is well ignited, anthracite is added by little at a time, usually not more than a single shovel full, and in lumps, commonly not above six inches in diameter. If larger than this, they would remain too long in mass, dark and ineffectual; if small egg or nut coal alone were used, it would, it is alleged, by the jarring of the locomotive, spread over the whole fire at once, and check the evaporation. While under way, the bed of coal upon the grate is kept at a thickness of five, or at most, six inches. When fresh coal is added, care is taken, that a single shovel full only is put on at once, and that this is thrown on the part which appears thinnest. Much experience in watching the indications of a manometre, while generating steam by anthracite, enables me fully to appreciate the importance of these practical precautions. In some of the attempts to use anthracite on the Reading Railroad, a bed of 18 inches thick is said to have been allowed to accumulate on the grate. In such cases, the whole engine is said to have become excessively overheated, and a flame to have passed out at the chimney. This is easily understood, when we consider that, in passing through so thick a mass of hot coal, the carbonic acid at first formed, (CO_2) by taking up a second proportional of carbon, becomes $CO+CO$, or two proportionals of carbonic oxide. The atmospheric air to ignite this compound, gains admittance partly through the chinks of the fire door, and the dust box door, and is partly found near the chimney top, where the intermitting blast through a single jet pipe, keeps the chimney alternately receiving and emitting air.

The second evil, that resulting from the highly concentrated heat, has been found much more serious than the preceding. Grate bars were burned out in a few weeks. Capt. A. H. Vancleve, who had charge of the Beaver Meadow Road, states that, at one period, wrought iron bars were substituted for cast, but that it required two smiths' fires to be in constant employ, to make grate bars for four locomotive engines. The secret of preventing this occurrence, was stated by a gentleman at Hazleton, to have been discovered by accident. A boulder, which had rolled from a slope upon the track of the railroad, tore off the ash box of the first engine which passed. As the damage did not interfere with the running of the engine, and as it was not convenient, for some days, to return to the machine shop, it was permitted to continue its trips for some days, without an ash box. The overheating and wasting of grate bars were so manifestly obviated during the time, as to attract immediate attention. Ash boxes were successively removed from other engines, and, from the adoption of this alteration to the present time, the destruction of grate bars has ceased to be a source of serious inconvenience. A set in the locomotive Franklin, were put in in June, 1846, and were in use, and in good order, at the end of May, 1847.

It might be supposed that the wooden superstructure of the road, and particularly that of bridges, would be endangered by the constant

falling of sparks. In the main, it may be said, that this evil at length cures itself, for both road and bridges, except the rails, become covered with a stratum of cinder, and fine particles of coal, which effectually defends all beneath from danger of igniting by particles of hot matter from the grate. Unlike particles of ignited charcoal, these are, from their very weight, not liable to be easily raised and blown about, by the currents of air created by the cars, which pass over them after they reach the road. Hence the only precaution which has been found necessary, is to place two sheets of iron, one on each *side* of the bottom of the fire box, extending downwards about nine inches, and sloping inwards, to confine the falling cinders to the central part of the track. At first a watch was established at the bridges, but when the roadway became covered with cinder, there was found to be very little danger from this source. The Hazleton and Beaver Meadow Roads have wooden rails, laid with flat iron bars; where edge or T rails are used, the danger would be manifestly less than in the case of these roads, which have so long used anthracite without detriment.

The concentrated heat of anthracite fires, generally affects injuriously only the laps and rivets of the fire box, unless the iron of that part of the boiler be of inferior quality. Hence the importance of selecting the very best of iron for the fire box, and the probable utility, as suggested by Capt. Vancleve, of subjecting it to a high temperature before using any plate for this purpose, in order to detect blisters or imperfect weldings, if such exist in the interior. The number of pieces used in the lower part of a fire box, ought to be the least possible, and the horizontal laps ought not to have their edges presented downwards to the action of the rising flame. I see no practical difficulty in the way of rolling sheets 18 inches wide, long enough to form the entire circuit of the lower part of a fire box. Above that height there would be no danger from this peculiar action of the fire. Nor do I know of any serious objection to welding together the ends of such a sheet, especially if made three-eighths of an inch, or more, in thickness, and thus forming a band in which not a single joint or rivet should come in contact with the fire. All other parts of the boiler would still be made in the ordinary manner.

The locomotive Lehigh commenced running on the Hazleton Road in 1838. In 1844 it was found necessary to renew a space of about 18 inches, in the lower part of the fire box, and this is the only repair which that part has undergone since the engine was put upon the road. I examined it in the latter part of May, 1847, and found the iron, to all appearance, sound and good, with no leaks at the rivets, or elsewhere. Three or four of the upper rows of tubes in this engine, have been in use since 1839, and the rest were renewed about two years ago.

To avoid the conversion of ashes into clinker, those anthracites should be selected, which are free from slaty plies, and which contain the least of sulphuret of iron, or other fusible impurities. Should any inconvenience be found from clinker on a prolonged trip, it could easily be removed at a watering station, by means of a forked fire hook, adapted to that peculiar service. A small supply of wood may

be carried, for re-kindling, in case of unusual delays. But the experienced fireman will always be careful to clear coal and clinker from his grate, before he attempts a renewal with wood.* Grates may be hinged, with a view to the prompt discharge of their contents, and, with that facility, the re-kindling with wood may take place even without stopping the engine, especially if advantage be taken of a favorable grade of the road.

The third point of difficulty, that resulting from the cutting away of copper tubes, is fully obviated by the substitution of iron, with the farther advantage of economy in the first cost. But this brings us to the fourth and last difficulty—that of securing iron tubes to the heads of the boiler.

This has been attempted in several different ways. One consists in cutting a screw at each end of the tube, to enter corresponding threads cut in the heads of the boiler, and then riveting over the projecting edges of the tubes. That on which Mr. Baldwin has founded a patent, consists in brazing a short piece of copper tube to each end of the iron one, and then connecting the former with the head of the boiler, in the same manner as he puts in copper tubes. But that which seems the most simple, and which is quite effectual, as proved at Beaver Meadow and Hazleton, for a course of years, is the turning off of the iron tubes, on the outside, at each end, in the form of the frustrum of a cone, to the distance of seven-tenths of an inch, by which the thickness of the tube at the extremity is reduced about one-half. This conical part receives a ring of copper, cylindrical within, conical without, and about half an inch wide, which, after the iron tube has been inserted in its place, is driven on to its conical termination, filling the space between it and the edge of the aperture in the head of the boiler. This copper ring, by its wedging effect, tightens the iron tube, forms a close joint, and allows the edge of the iron tube to be slightly opened out, and riveted, to form a very perfect juncture. The language used in describing the result of this mode of fitting in the tubes, was, that the "joints never leaked a drop." In rare instances, the welding of a tube, (made by the same process as gas tubes,) is found slightly defective, but this does not long put a stop to the use of the engine, for a very little labor suffices to tap a screw in each end, and plug up a single defective tube, till a convenient opportunity occurs for its removal. To clear dust of anthracite from the tubes, a species of screw auger, with a sharp edge, like that of a chisel, is occasionally employed.

The quantity of anthracite commonly used in a round trip of 30 miles, on the Hazleton Road, is from a ton to a ton and a half, hauling 35 to 40 cars, and conveying from 100 to 120 tons of coal. The grades on this road are heavy,—60, 80, and 140 feet per mile,—all in the direction of the trade. The severest labor is, consequently, encountered, in taking back the empty trains. In two experiments, conducted by Capt. Vancleve, over the Beaver Meadow Road, reducing its grades by Pambour's formula, to the condition of a level, he found

*This, and the succeeding precaution, are suggested by Capt. Vancleve.

that the seven ton engine required 1¼ pounds of anthracite per ton, per mile, of *freight and cars* hauled, and the 13 ton engine took but one pound, for the same labor. The small engine was subject to slipping of its wheels, on the high grades, which, of course, impaired the efficiency of its fuel.

Those who are most familiar with this subject, attribute to the early, persevering, and well directed efforts of the Hon. Samuel D. Ingham, formerly President of the Beaver Meadow Railroad Company, much of the credit of urging on to final success, the experiments which have proved so important to the interests of that coal region.

MECHANICS, PHYSICS, AND CHEMISTRY.

On the Gauges at present used, for measuring the thickness of sheet metals and wires, and proposals for a new system of Gauges, founded on the decimal subdivision of the Standard Inch. By C. HOLTZAPFFEL.

From the Glasgow Practical Mechanic and Engineers' Magazine.

In setting out the Tables of the dimensions of saws, the author could only express their several thicknesses, in the measure always employed for that purpose, namely, in the sizes or numbers of the "Birmingham wire gauge," and to render these measures intelligible to the general reader, the author then determined to introduce in this appendix—first, the exact values of the principal gauges in use for sheet metals and wires, a subject he believes to have been hitherto overlooked; and secondly, a proposal he has long desired to see carried out, namely, an easy and exact system of gauges for sheet metals, wires, and general purposes, founded on the decimal division of the inch; and in which system, the nomenclature should be so completely associated with the actual measures, as to convey to the mind, even in the absence of the gauges themselves, a very close idea of the several spaces of the gauge, or of the thicknesses or sizes of the works measured thereby.

It is to be observed, at the outset, that the gauges for measuring wires and sheet metals, are usually thick plates of steel of several sizes and forms, around and near the edges of which are first drilled various holes, the next step is to saw a notch from the edge into every hole, saws of the widths of the several notches being used; and lastly, little parallel plates of steel, called *drifts*, which are hardened and tempered, are driven into the notches, in order to smooth the sides of the same and render them of uniform width, after the manner of various other applications of drifts.

It should be further observed that the Birmingham and other guages seem to have been originated, in a great measure, accidentally, or almost by the eye alone, and without any attempt at system, either as regards the values of the intervals between the successive measures or numbers, or their correspondence with the subdivisons of the inch. And as moreover gauges, nominally the same, have been made

by various manufacturers with insufficient aim at unity of measures, some irregularity thence exists amongst the gauges in common use, notwithstanding that they may be nominally alike.

Values of Gauges for Wire and Sheet Metals in General Use. Expressed in Decimal Parts of the Inch.

SECTION ONE.	SECTION TWO.	SECTION THREE.		
Birmingham Gauge for Iron Wire, and for Sheet Iron and Steel.	Birmingham Gauge for Sheet Metals, Brass, Gold, Silver, &c.	Lancashire Gauge for Round Steel Wire, and also for Pinion Wire. The smaller sizes distinguished by Numbers. The larger by Letters, and called the Letter Gauge.		
MARK. SIZE.	MARK. SIZE.	MARK. SIZE.	MARK. SIZE.	MARK. SIZE.
0000—·454	1—·004	80—·013	40—·096	A —·234
000—·425	2—·005	79—·014	39—·098	B —·238
00—·380	3—·008	78—·015	38—·100	C —·242
0—·340	4—·010	77—·016	37—·102	D —·246
1—·300	5—·012	76—·018	36—·105	E —·250
2—·284	6—·013	75—·019	35—·107	F —·257
3—·259	7—·015	74—·022	34—·109	G —·261
4—·238	8—·016	73—·023	33—·111	H —·266
5—·220	9—·019	72—·024	32—·115	I —·272
6—·203	10—·024	71—·026	31—·118	J —·277
7—·180	11—·029	70—·027	30—·125	K —·281
8—·165	12—·034	69—·029	29—·134	L —·290
9—·148	13—·036	68—·030	28—·138	M —·295
10—·134	14—·041	67—·031	27—·141	N —·302
11—·120	15—·047	66—·032	26—·143	O —·316
12—·109	16—·051	65—·033	25—·146	P —·323
13—·095	17—·057	64—·034	24—·148	Q —·332
14—·083	18—·061	63—·035	23—·150	R —·339
15—·072	19—·064	62—·036	22—·152	S —·348
16—·065	20—·067	61—·038	21—·157	T —·358
17—·058	21—·072	60—·039	20—·160	U —·368
18—·049	22—·074	59—·040	19—·164	V —·377
19—·042	23—·077	58—·041	18—·167	W —·386
20—·035	24—·082	57—·042	17—·169	X —·397
21—·032	25—·095	56—·044	16—·174	Y —·404
22—·028	26—·103	55—·050	15—·175	Z —·413
23—·025	27—·113	54—·055	14—·177	A 1—·420
24—·022	28—·120	53—·058	13—·180	B 1—·431
25—·020	29—·124	52—·060	12—·185	C 1—·443
26—·018	30—·126	51—·064	11—·189	D 1—·452
27—·016	31—·133	50—·067	10—·190	E 1—·462
28—·014	32—·143	49—·070	9—·191	F 1—·475
29—·013	33—·145	48—·073	8—·192	G 1—·484
30—·012	34—·148	47—·076	7—·195	H 1—·494
31—·010	35—·158	46—·078	6—·198	
32—·009	36—·167	45—·080	5—·201	
33—·008		44—·084	4—·204	
34—·007		43—·086	3—·209	
35—·005		42—·091	2—·219	
36—·004		41—·095	1—·227	

In ascertaining the precise measures of the principal gauges, the author has had the valuable co-operation of the Messrs. Stubs, of Warrington, who manufacture a large number of these gauges, and

who tested the drifts they employ, by means of a sliding gauge, constructed by Holtzapffel & Co., for reading off quantities to the thousandth part of an inch, by means of a vernier; the results of these admeasurements are stated in the three sections of the accompanying table.

The three series of measures or gauges particularized in the annexed table, have no relation whatever to one another; for example, the numbers 10 of the table are respectively different and undefined quantities, or are neither aliquot nor direct fractional parts of the inch, as the number 10 notches are severally ·134, ·024, and ·190 of an inch wide; and other similar numbers are also unrelated.

The approximate measures of any one of these three series may, perhaps, be moderately familiar to those artizans who use that particular gauge, but these same artizans will probably be as little informed of the two other gauges, as the generality of individuals, to whom the whole of these, and other arbitrary ill-defined measures are vague and confused; because their nomenclatures have no relation whatever, either to one another, or to our general standard of such quantities, namely, ordinary linear measure; or in other words, the standard foot and inch.

The following explanatory remarks on the three gauges specified in the table, and certain other gauges derived from them, will show the complicated and uncertain nature of the subject of measures for wires, sheet metals, and various small works.

1. The first column of the Table refers to the gauge used for most kinds of wire, and is thence called for the sake of brevity, the "Wire gauge," although it is also known as the "Birmingham wire gauge," the "Birmingham iron wire gauge," and the "Sheet iron gauge." This gauge, which is specified in the column of the Table headed Section one, is the most common of the three principal kinds, and is employed not only for iron wire, as its name implies, but also for brass and other wires, for black steel wire, also for sheet iron, sheet steel, and various other materials, and likewise for some manufactured works, including screws for joiners' use.

On reference to the Table, it appears the largest notch of the Birmingham iron wire gauge, is marked 0000, and measures 454 thousandths of an inch, or 4½ tenths of an inch nearly; and further, that the smallest notch, marked 36, measures 4 thousandths, or the 1-250th part of an inch. Although this gauge seems only to possess 40 terms, in reality not less than 60 sizes of wire are made, as intermediate sizes are in many cases added; and occasionally, although the sizes are retained, their numbers are variously altered: thus,

The sizes of wires drawn for manufacturing needles correspond with some of the ordinary wire sizes, but the numbers are different; thus No. 1. of the needle wire, agrees with 18½ of the Birmingham wire guage as here shown:—

Needle wires, Nos. 1. 2. 2½. 3. 4. 5. and thence to 21.

And Birmingham wire guage, Nos. 18½. 19. 19½. 20. 21. 22. and thence to 38., are respectively alike.

Sometimes half sizes of both series are interpolated, and the manufactured needles, when bought and sold, are designated by another series of numbers, unrelated to either of these wire sizes.

Numbers of the Screws.	Numbers of the Wire Gauge.	Numbers of the Screws.	Numbers of the Wire Gauge.	Numbers of the Screws.	Numbers of the Wire Gauge.	Numbers of the Screws.	Numbers of the Wire Gauge.
25	0000	14	3	7	9	1	15
23	000	12	4	6	10	0	16
22	00	11	5	5	11	00	17
21	0	10	6	4	12	000	18
17	1	9	7	3	13		
16	2	8	8	2	14		

In the wire used for the strings of piano-fortes, the sizes now commonly used, are known as Nos. 6 to 20, and these agree very nearly with the sizes and half-sizes of some of the notches of the Birmingham wire gauges, as follows:—

Music wires, Nos. 6. 7. 8. 9. 10. 11. 12. 14. 16. 18. 20.

And Birmingham wire gauge, Nos. 26. 25½. 25. 24½. 24. 23½. 23. 22. 21. 20. 19., are respectively alike.

The number 6, or the thinnest music wire now commonly used, measures about the fifty-fifth part of an inch in diameter, and the No. 20, or the thickest, measures about the twenty-fifth of an inch.

Piano-fortes were formerly always strung with brass wire, but steel is now alone employed, and they are "strung much heavier," or thicker wires are employed, from which cause the numbers 1 to 5 have probably fallen into disuse. The covered strings are of steel, upon which a fine copper wire is spirally wound; and in very short strings, as those in Mr. Pape's Console Piano-fortes, and some others, two covering wires are used, that the bulk of the doubly-covered strings may compensate for their want of length.

The manufacturers of the patent screws made from iron wire, for joiners' use, also give the intervals of the wire gauge a new system of numbers. Thus in the annexed Table, the left hand columns show the numbers of the screws, the right hand, the numbers of the wires from which they are respectively made.

Examples of other and similar conversions of the numbers might be shown, but which would only serve further to illustrate the irregularity, and arbitrary nature of gauges, used in the mechanical and other arts.

2. The second column of the Table, refers to the gauge employed for most of the sheet metals, (excepting iron and steel,) namely, copper, brass, gilding-metal, gold, silver, platinum, &c. This gauge is called the "Birmingham metal gauge," and for brevity, simply the "Metal gauge," or the "Plate gauge," in contradistinction to the "Wire gauge," specified in the first column of the Table.

The intervals in the metal or plate gauge, are closer or smaller than

those of the wire gauge. Thus the No. 1, which in this series is the *smallest* sized notch, is 4 thousandths or the 250th part of an inch wide, whilst the largest notch, or 36, measures 167 thousandths, or is evidently meant for the sixth part of an inch.

When thicker metals are wanted, their measures are sought in the Birmingham wire gauge; thus the 36 on the plate gauge, nearly agrees with the 8 on the wire gauge, and therefore the numbers 7, 6, 5, to 0000 of the latter, are then employed for thicker metals than can be measured by the plate gauge. Frequently the plate gauge ends at 24, which number agrees with 14 of the wire gauge, and then the numbers 13, 12, 11, to 000 of the latter are similarly resorted to for thicker metals. These combinations of different series of numbers, running in reverse orders, are evidently liable to lead to confusion.

The method in which sheet metals are commercially described, also present much variation, for instance zinc has a gauge thus constituted—

Sheet zinc	Nos. 6. 7. 8. 9. 10. 11. 12. 13. 14. 15. 16.
B. Plate gauge	Nos. 4. 4½. 5. 6. 7. 8. 9. 10. 11. 12. 13.

are nearly alike.

These thin sheets of zinc, which measure only from one to four hundredths of an inch thick, are principally used for gutters, roofs, and small works manufactured with the hammer.

Thicker zinc plates, or those from about 5 to 18 hundredths thick, and which are used for zincography, door plates, and engraved works, are commonly made to the notches, 18 to 7 of the Birmingham wire gauge, without alteration of the numbers, but which run the reverse way of those of the other series used for zinc.

Several of the metals are estimated by the weight of every superficial foot, and that the more especially when the value of the material, in the sheet, exceeds the value of the labor afterwards expended upon it in converting the metal to its intended purpose; thus:—

Cast and milled lead are both described as of from 4 to 12 pounds to the superficial foot, the variation being one pound to the foot.

Coppersmiths and braziers do not acknowledge the plate gauge at all, but reckon their metal as from about 3 to 56 pounds to the sheet: the sheet measures 2 feet by 4 feet, and therefore contains 8 superficial feet.

The precious metals are sometimes estimated as of so many ounces or pennyweights troy to the superficial foot; and it will be hereafter shown, how by the aid of the proposed scheme, derived from the decimal subdivision of the inch, the correspondence between the relative weights and thicknesses of metals, may be critically arrived at with great simplicity.

The third, fourth, and fifth columns of the Table constitute one series of gauges, employed exclusively for the bright steel wire prepared in Lancashire, and the steel pinion wire for watch and clock-makers.

The smallest notch of this series is called No. 80, and measures 13 thousandths of an inch, or about the 120th of an inch; and the first part of this series continues unto No. 1, which measures 227 thousandths, or nearly one quarter of an inch.

The steel wire gauge apparently ended at this size in the first instance, but has since been extended by a second series to the diameter of 494 thousandths, a measure doubtless intended for half an inch. In order to avoid the confusion attendant upon two series of numerals, meeting at zero in the midst, the larger sizes are distinguished by the letters A to Z, and these terms are then continued under the denominations A 1, B 1, C 1, D 1, to H 1, which latter size is the largest, and measures 494 thousandths of an inch, as shown by the Table. This second part of the Lancashire wire gauge, is called, by way of distinction, the "Letter gauge."

Many other gauges of arbitrary characters came to the author's knowledge in this inquiry, several of which are applicable, alone, to particular trades; amongst these may be mentioned, the rod iron gauge, the nail rod gauge, the buttonmaker's gauge, others used in watchwork, and the gauge used by gunmakers for the bores of guns and rifles; three of which gauges alone will be described.

The rod iron gauge, employed by Messrs. Bradleys, and some other iron masters, and also by Messrs. Stubs, for steel, has measures derived from the division of the inch into 8ths and 64ths, as follows:—

Messrs. John Bradley & Co.'s Rod Iron Gauge.

No.	Inch.	No.	Inch.	No.	Inch.	No.	Inch.
00	$\frac{1}{8}$	5	$\frac{5}{16}$	11	$\frac{1}{2}$	17	$1\frac{1}{8}$
0	$\frac{5}{32}$	6	$\frac{11}{32}$	12	$\frac{9}{16}$	18	$1\frac{1}{4}$
1	$\frac{3}{16}$	7	$\frac{3}{8}$	13	$\frac{5}{8}$	19	$1\frac{3}{8}$
2	$\frac{7}{32}$	8	$\frac{13}{32}$	14	$\frac{3}{4}$	20	$1\frac{1}{2}$
3	$\frac{1}{4}$	9	$\frac{7}{16}$	15	$\frac{7}{8}$		
4	$\frac{9}{32}$	10	$\frac{15}{32}$	16	1		

Messrs. John Bradley & Co.'s Nail Rod Gauge.

No.	Inch.	No.	Inch.	No.	Inch.	No.	Inch.
00	$\frac{1}{8}$	$1\frac{1}{2}$	$\frac{13}{64}$	4	$\frac{9}{32}$	7	$\frac{3}{8}$
$00\frac{1}{2}$	$\frac{9}{64}$	2	$\frac{7}{32}$	$4\frac{1}{2}$	$\frac{19}{64}$	8	$\frac{13}{32}$
0	$\frac{5}{32}$	$2\frac{1}{2}$	$\frac{15}{64}$	5	$\frac{5}{16}$	9	$\frac{7}{16}$
$0\frac{1}{2}$	$\frac{11}{64}$	3	$\frac{1}{4}$	$5\frac{1}{2}$	$\frac{21}{64}$	10	$\frac{15}{32}$
1	$\frac{3}{16}$	$3\frac{1}{2}$	$\frac{17}{64}$	6	$\frac{11}{32}$	11	$\frac{1}{2}$

It will be perceived that the intervals, from $00\frac{1}{2}$ to $3\frac{1}{2}$ are the 64th of an inch, from 4 to 11 the 32nd, and above 13, the differences are $\frac{1}{8}$ of an inch. This mode, although systematic, is objectionable, as there is no evident relation between the numbers and their corresponding measures, and therefore both have to be impressed upon the mind.

In guns of most kinds, the weight of the balls determine the denominations of their respective sizes. Thus it is well known that heavy guns or ordnance are named 6, 9, 12, to 68 pounders, from having

bores respectively suited to iron shots of those respective weights, the bore is always $\frac{1}{30}$th larger in diameter than the shot, the difference being known as *windage*. The sizes of the bores of mortars and modern guns intended for hollow shot, are designated in inches, as 8, 10, 12 inch mortars, &c.

In rifles and fowling pieces, the diameters of the bores, designated as No. 1, 2, 3, 4, 5, &c., are the diameters respectively of leaden bullets or spheres, of which 1, 2, 3, 4, 5, &c., weigh exactly one pound avoirdupois; and as the subject may have an interest for some of the readers of this volume, the following particulars of the weights of the balls in grains, and of the diameters both of the balls and of the barrels in hundredths of an inch, are transcribed from Mr. Wilkinson's gauge which he has constructed with great care:—

Mr. Wilkinson's Gauge for Rifles and Fowling Pieces.

Number.	Diameter of bore in hundredths.	Weight of Leaden Bullet in Grains.	Number.	Diameter of bore in hundredths.	Weight of Leaden Bullet in Grains.	Number.	Diameter of bore in hundredths.	Weight of Leaden Bullet in Grains.
5	·98	1400	15	·70+	$466\frac{2}{3}$	25	·60+	280
6	·93—	$1666\frac{2}{3}$	16	·69—	$437\frac{1}{2}$	26	·59+	$269\frac{3}{13}$
7	·89	1000	c 17 p	·67+	$411\frac{3}{17}$	27	·59	$269\frac{7}{27}$
8	·85—	875	18	·66	$388\frac{8}{9}$	28	·58+	250
9	·81—	$777\frac{7}{9}$	19	·65+	$368\frac{8}{19}$	29	·58—	$241\frac{11}{29}$
10	·79	700	20	·63+	355	30	·57	$233\frac{1}{3}$
m 11 p	·77—	$636\frac{4}{11}$	21	·63	$333\frac{1}{3}$	31	·56+	$225\frac{25}{31}$
12	·75+	$583\frac{1}{3}$	22	·62+	$318\frac{2}{11}$	32	·56—	$218\frac{3}{4}$
13	·74—	$538\frac{6}{13}$	23	·61+	$304\frac{8}{23}$			
14 s	·72—	500	24	·61	$291\frac{2}{3}$			

From the perusal of the foregoing particulars of numerous gauges, employed in different branches of mechanical art, it will have been seen that little analogy on the one hand, but great confusion on the other, exist in such of the gauges as have been referred to; and the author will now briefly state the remedy he would suggest to obviate the difficulty in the most simple and inexpensive manner.

(To be continued.)

On the Production of Light by Heat. *By* John William Draper, M. D., *Professor of Chemistry in the University of New York.*

From the London, Edinburgh, and Dublin Philosophical Magazine.

Although the phenomenon of the production of light by all solid bodies, when their temperature is raised to a certain degree, is one of the most familiar in chemistry, no person, so far as I know, has hitherto attempted a critical investigation of it. The difficulties environing the inquiry are so great, that even among the most eminent philosophers a diversity of opinion has prevailed, respecting some of the leading facts. Thus Sir Isaac Newton fixed the temperature at which bodies

become self-luminous at 635°, Sir Humphry Davy at 812°, Mr. Wedgwood at 947°, and Mr. Daniell at 980°. As respects the nature of the light emitted there are similar contradictions. In some philosophical works of considerable repute, it is stated that when a solid begins to shine it first emits red and then white rays; in others it is asserted that a mixture of blue and red light is the first that appears.

I have succeeded in escaping or overcoming many of the difficulties of this problem, and have arrived at satisfactory solutions of the main points; and as the experiments now to be described lead to some striking and perhaps unexpected analogies between light and heat, they commend themselves to our attention as having a bearing on the question of the identity of those imponderable principles. It is known that heretofore I have been led to believe in the existence of cardinal distinctions, not only between these but also other imponderable agents; and I may therefore state, that when this investigation was first undertaken, it was in the expectation that it would lead to results very different from those which have actually arisen.

The following are the points on which I propose to treat:—

1. To determine the point of incandescence of platinum, and to prove that different bodies become red-hot at the same temperature.

2. To determine the color of the rays emitted by self-luminous bodies at different temperatures. This is done by the only reliable method—analysis by the prism.

From these experiments it will appear, that as the temperature rises the light increases in refrangibility; and, making a due allowance for the physiological imperfection of the eye, the true order of the colors is red, orange, yellow, green, blue, indigo, violet.

3. To determine the relation between the brilliancy of the light emitted by a shining body and its temperature.

Here we shall find that the intensity of the light increases far more rapidly than the temperature. For example, platinum at 2600° emits almost forty times as much light as it does at 1900°.

As I prefer to give a complete description of the apparatus employed in these investigations, after the general results are stated, it is sufficient here to understand that the source of light is in all instances a very thin strip of platinum, 1·35 inch long and $\frac{1}{20}$th of an inch wide, brought to the temperature under investigation by a voltaic current. Platinum was selected from its indisposition to oxidize, and its power of resisting a high temperature without fusion.

The slip of platinum, thus to be brought to different temperatures by an electric current of the proper force, was fastened at one end to an inflexible support, and at the other was connected with a delicate lever-index, which enabled me to determine its expansion, and thereby its temperature. For this purpose I have used the coefficient of dilatation of Dulong and Petit. The temperatures here given are upon the hypothesis of the invariability of that coefficient at all thermometric degrees; they are therefore to some extent in error.

By the aid of resisting wires of different lengths and a rheostat, I was able to vary the force of the electric current in the platinum, and

thereby vary its temperature. My first attempts were to discover the point at which the metal begins to emit light.

The platinum and the voltaic battery were placed in a dark room, the temperature of which was 60°; and after I had remained there a sufficient length of time to enable my eyes to become sensible to feeble impressions of light, I caused the current to pass, gradually increasing its force, until the platinum was visible. In several repetitions of this experiment it was uniformly found that the index to which the platinum was attached stood at the eighth division when this took place. The metal had therefore dilated $\frac{1}{222}$ of its length; the elevation of its temperature was about 917°, which added to the existing height of the thermometer, 60°, gives for the temperature of incandescence 977° F.

To the correctness of the number it may be objected, that owing to narrowness of the metallic strip it is not well calculated to make an impression on the eye when the light it emits is so feeble; nor can we take the dilatations given by the index, as representing the uniform temperature of the whole platinum, which must necessarily be colder near its points of support, by reason of the conducting power of the metals to which it is attached.

Physiological considerations would also lead us to suspect that the self-luminous temperature must vary with different eyes. The experiments of Bouguer, hereafter to be referred to, indisputably show that some persons are much more sensitive to the impressions of light than others. So far as my limited investigation of this matter has gone, I have not, however, found appreciable differences in the estimate of the temperature of incandescence. Different individuals, observing the platinum, have uniformly perceived it at the same time.

Against the number 977° it may also be objected, that antimony melts at a much lower temperature, and yet emits light before it fuses. If this statement were true, it would lead us to believe that all bodies have not the same point of incandescence. But I think the experiments of Mr. Wedgwood on gold and earthenware are decisive of that question; and, moreover, I have reason to believe that the melting-point of antimony is much higher than is commonly supposed.

With a view of determining directly whether different bodies vary in their point of incandescence, I took a clean gun-barrel, and having closed the touch-hole, exposed the following substances in it to the action of the fire:—platinum, chalk, marble, fluor spar, brass, antimony, gas-carbon, lead; each specimen was small; the platinum was in the form of a coil of stout wire.

When one of these bodies was placed in the gun-barrel and the temperature raised, it is clear that any difference in their point of incandescence would be detected by the eye. Thus, if the ignition of platinum required a higher degree than iron, on looking down the barrel the coil of wire should be dark, when the barrel itself begins to shine; or, if the platinum was incandescent first, the wire should be seen before the barrel is visibly hot; and these results might be corroborated by observing the inverse phenomena, when the barrel is taken from the fire and suffered to cool.

With respect to platinum, brass, antimony, gas-carbon and lead, they all became incandescent at the same time as the iron barrel itself. I could not discover the slightest difference between them, either in heating or cooling; and it is worthy of remark, that the lead was of course in the liquid condition. But the chalk and marble were visible before the barrel was red-hot, emitting a faint white light; and the fluor spar still more strikingly so, its light being of a beautiful blue; and even when the barrel had become bright red, I could still see the spar, which had decrepitated to a coarse powder, by its faint blue rays. In these cases it was not, however, incandescence but phosphorescence that was taking place. I infer then that all solids, and probably melted metals, shine at the same thermometric point.

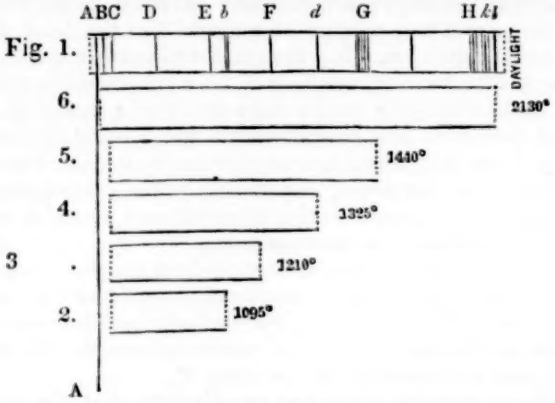
The temperature of incandescence seems to be a natural fixed point for the thermometer; and it is very interesting to remark how nearly this point coincides with 1000° of the Fahrenheit thermometer, when Laplace's coefficient for the dilatation of platinum is used. Upon that coefficient the point of incandescence is 1006° F.

In view of these considerations, and recollecting that the number given by Daniell is 980°, and that of Wedgwood 947°, I believe that 977° is not very far from the true temperature at which solids begin to shine. It is to be understood, of course, that this is in a very dark room.

I pass now to the second proposition. The rays emitted by the incandescent platinum were next received on a flint glass prism, placed so as to give the minimum deviation, and after dispersion viewed in a small telescope. A movement could be given to the telescope, which was read off on an annexed scale. However, instead of bringing the parts of the spectrum under measurement to coincide with the wires stretched across the field of the instrument, I found it more satisfactory to determine them by bringing them to one or other of the edges of the field; a process well adapted to ascertain the position of the extreme rays, the faint light of which contrasted well with the darkness by which it was surrounded. They could not have been so accurately seen while the rest of the spectrum was in view; and as it was absolutely necessary to have fixed points of reference, that all the observations might be brought to a common standard of comparison, and as there are no fixed lines in the light of incandescence, such as are in the sunshine and daylight, I therefore previously determined the position of the fixed lines in a spectrum formed by a ray of reflected daylight, which passed through a fissure $\frac{1}{10}$th of an inch wide and one inch long, occupying exactly the position subsequently to be occupied by the incandescent platinum. Fig. 1 represents the results of this observation.

The strip of platinum was now placed in the position of the fissure which had given the spectrum fig. 1, and its temperature was raised by the passage of a voltaic current. Although I could distinctly see the metal when the heat had reached about 1000° by the naked eye, yet the loss of light in passing the prism and telescope was so great that I found it necessary to carry the temperature to 1210° before a satisfactory observation could be made. At this point the spectrum

extended from the position of the fixed line B in the red, almost as far as the line F in the green; the colors present being red, orange, and a



Spectra of incandescent platinum at different temperatures.

tint which may be designated as gray. There was nothing answering to a yellow. The first rays visible through this apparatus may therefore be designated as red and greenish gray; the former commencing at the line B, and the latter continuing to F. The magnitude and other relations of this spectrum are given in fig. 3.

The voltaic current was now increased, and the temperature rose to 1325°. The red end of the spectrum remained nearly as before, but the more refrangible extremity reached to the position of the little fixed line *d*. Traces of the yellow were now visible; and, with a certain degree of distinctness, I could see red, orange, yellow, green, and a fringe of blue. Fig. 4 shows the result.

The temperature was now carried to 1440°. I thought the red extremity was advancing more to the line A: the blue had undergone a well marked increase. It reached considerably beyond the line G, as shown in fig. 5.

On bringing the platinum to 2130° all the colors were present and exhibited considerable brilliancy. Their extent was somewhat shorter than that of the daylight spectrum, as is seen in fig. 6.

Having thus by repeated experiments ascertained the continued extension of the more refrangible end as the temperature rose, it became necessary to obtain observations for points below 1210°, the limit of visibility through the telescope. I therefore carried the prism nearer to the platinum, and, looking with the unassisted eye directly through it at the refracted image, I found it could be distinctly seen at a temperature as low as 1095°. Under these circumstances the total length could not be compared by direct measurement with the other observations, and the result given in fig. 2 is from the best judgment I was able to form: the colors were red and greenish-gray.

The gray rays emitted by platinum just beginning to shine appear to be more intense than the red; at all events the wires in the field of the telescope are more distinctly seen upon them than upon the other

color. I give them the designation of gray, for they appear to approach that tint more closely than any other; and yet it is to be remarked that they are occupying the position of the yellow and green regions.

Already we have encountered a fact of considerable importance. The idea, that as the temperature of a body rises it begins to emit rays of increasing refrangibility, has obviously to be taken with a certain restriction. Instead of first the red, then the orange, then the yellow, &c., rays, in succession making their appearance, in which case the spectrum should regularly increase in length as the temperature rises, we here find, at the very first moment it is visible to the eye, it yields a spectrum reaching from the fixed line B to nearly F: that is to say, equal to about two-thirds the whole length of the interference spectrum, and almost one-half of the prismatic.

It is to be remarked, that while the more refrangible end undergoes a great expansion, the other extremity exhibits a corresponding though a less change. As very important theoretical conclusions depend on the proper interpretation of this fact, we must not forget that, to a certain extent, it may be an optical deception, arising from the increased brilliancy of the light. While the rays are yet feeble, the extreme terminations may be so faint that the eye cannot detect them; but as the intensity rises, they become better marked, and an apparent elongation of the spectrum is the consequence.

It is agreed by optical writers, that to the human eye the yellow is the brightest of the rays. In the prismatic spectrum the true relationship of the colors is not perceived, because the less refrangible are crowded together, and the more refrangible unduly spread out. But in the interference spectrum, where the colors are arranged side by side in the order of their wave-lengths, the centre is occupied by the most luminous portion of the yellow; and from this point the light declines away on one side in the reds, and on the other in the blues, the terminations being equidistant from the centre of the yellow space.

Now if the rays coming from shining platinum were passed through a piece of glass, on which parallel lines had been drawn with a diamond point, so as to give an interference spectrum, even admitting the general results of the foregoing experiments to be true, viz. that as the temperature rises rays of a higher refrangibility are emitted, it is obvious that it by no means follows that the first ray visible should be the extreme red. Our power of seeing that depends on its having a certain intensity. Even when it has assumed that extreme brilliancy which it has in a solar beam it is barely visible. We ought, therefore, to expect that rays of a higher refrangibility should first be seen, because they act more energetically on our organ of vision; and, as the temperature rises, the spectrum should undergo a partial elongation in the direction of its red extremity.

I may here remark, that the general result of these experiments coincides exactly with that of M. Melloni respecting heat at lower thermometric points. In his second memoir,* he shows that, when

* Taylor's Scientific Memoirs, vol. i. p. 56.

the rays from copper at 390° and from incandescent platinum are compared by transmission through a rock-salt prism, as the temperature rises the refrangibility of the calorific emanations correspondingly increases. Those philosophers who regard light and heat as the same agent, will therefore see in this coincidence another argument in favor of their opinion.

In view of the foregoing facts I conclude, that, *as the temperature of an incandescent body rises, it emits rays of light of an increasing refrangibility;* and that the apparent departure from this law, discovered by an accurate prismatic analysis, is due to the special action of the eye in performing the function of vision.

As the luminous effects are undoubtedly owing to a vibratory movement executed by the molecules of the platinum, it seems from the foregoing considerations to follow, that the frequency of those vibrations increases with the temperature.

In this observation I am led by the principle, that "to a particular color there ever belongs a particular wave-length, and to a particular wave-length there ever belongs a particular color;" but, in the analysis of the spectrum made by Sir D. Brewster by the aid of absorptive media, this principle is indirectly controverted; that eminent philosopher showing that red, yellow, blue, and consequently white light, exist in every part of the spectrum. This must necessarily take place when a prism which has a refracting face of considerable magnitude is used; for it is obvious that a ray falling near the edge, and one falling near the back, after dispersion, will paint their several spectra on the screen; the colors of the one not coinciding with, but overlapping, the colors of the other. In such a spectrum there must undoubtedly be a general commixture of the rays; but may we not fairly inquire whether, if an elementary prism were used, the same facts would hold good? or, if the anterior face of the prism were covered by a screen, so as to expose a narrow fissure parallel to the axis of the instrument, would there be found in the spectrum it gave every color in every part, as in Sir David Brewster's original experiment? M. Melloni has shown how this very consideration complicates the phenomena of radiant heat; and it would seem a very plausible suggestion that the effect here pointed out must occur in an analogous manner for the phenomena of light.

(To be continued.)

Apparatus for the Fusion of Iridium or Rhodium, or masses of Platinum less than five ounces in weight. By Professor Robert Hare, M. D.

An account of the apparatus for the fusion of platinum on a large scale was recently published in this Journal. On the republication of that account in Silliman's American Journal of Science, it occurred to the author to give an account of some smaller apparatus which it is proper to employ for fusing small masses, whether of platinum, of iridium, or rhodium. This addition is now subjoined.

For the fusion of either iridium or rhodium or masses of platinum

not exceeding the weight of half an ounce, an instrument with three jets has been employed, the bore of each jet pipe being such as not to admit a wire larger than the $\frac{1}{32}$ of an inch in diameter. The flame produced by these means was quite sufficient to envelope the mass to which it was applied.

In fusing any lumps or congeries of platinum, not exceeding five ounces, an instrument has been used capable of giving seven jets of gas, issuing, of course, from as many pipes. Of these pipes, six protrude through the brass casting forming the bottom of the copper case constituting the refrigerator, so as to be equi-distant from each other upon a circumference of three-fourths of an inch in diameter, the seventh protruding from the centre. The bores of these jets are such as not to admit a wire larger than $\frac{1}{32}$ of an inch in thickness. Those of the larger instruments, represented by the accompanying engravings, (See page 196, vol. 13, March, 1847,) were such as to admit wires of $\frac{1}{44}$th of an inch in thickness.

The jet pipes may be made by the following process:—A thin strip of sheet metal, somewhat wider than the length of the circumference required in the proposed pipe, after being roughly turned about a wire so as to form an imperfect tube, is drawn through several suitable holes in a steel plate, as in the wire-drawer's process. Under this treatment the strip becomes converted into a hollow wire; the edges of the strip being brought into contact reciprocally, so as to leave only an almost imperceptible crevice. Having drawn one strip of platina in this way, another strip sufficiently wide nearly to enclose it, is to be drawn over that first drawn: care being taken to have the crevices left at the meeting of the edges on contrary sides. The compound hollow wire or tube thus fabricated, is finally to be drawn upon a steel wire of the diameter of the requisite bore.

The following method of making jet pipes, though more difficult, is preferable; as there is less liability of the water of the refrigerator leaking into the bore:

Select a very sound and malleable cylinder of platinum, of about three-eighths of an inch in thickness, perforate it by drilling in a lathe, so that the perforation may be concentric with the axis. A drill between $\frac{1}{16}$th and $\frac{1}{8}$th of an inch in diameter may be employed. In the next place the cylinder may be elongated by the wire-drawing process, until the proper reduction of metallic thickness is effected, the diameter of the bore being prevented from undergoing an undue diminution, by the timely introduction of a steel wire.

Of course, the metal must be annealed, as often as it hardens, by drawing. For this purpose, a much higher temperature is necessary in the case of platinum, than in that of either copper, silver, or gold.

The annealing is best performed by the hydro-oxygen flame. If charcoal be used, the greatest care must be taken to have the fireplace clean.

Agreeably to a trial made last spring, palladium may be used as a solder for platinum; and as it is nearly as difficult to fuse as this metal, it is of course, for that purpose, preferable to gold where great heat is to be resisted. No doubt, by employing palladium to solder the ex-

terior juncture of the double drawn tubes above mentioned, they might answer as well nearly as when constructed of solid platinum.

This idea has been since verified by a successful trial; and, moreover, silver has been found to answer as solder for the portions of the tubes protected by being within the cavity filled with water. The exterior or protruding portions of the tubes, may be left unsoldered.

Vulcanized India Rubber Springs.

At the meeting of the Society of Arts, on the 14th inst., a paper was read "On Fuller and De Bergue's Vulcanized India Rubber Springs for Buffers, &c." The application of caoutchouc, or India rubber, to railway purposes, has of late years occupied, more or less, the attention of scientific men. Possessing, as this material does in a very high degree, the properties of flexibility and elasticity united with great tenacity and power of resistance under heavy pressure, its adaptation to various important and valuable purposes in mechanics was too obvious to have escaped notice; yet its liability to become hard and rigid when exposed to severe cold, and on the other hand soft and clammy under the influence of heat, were serious drawbacks to its extensive application; and it was not until very recently that the method of preparing it, by a patented process termed "vulcanizing," has imparted a value and importance to this simple material which is likely to lead to its much more extensive adoption in this and other departments than has hitherto been known. The process referred to, (and which is now pretty generally understood,) consists principally in the admixture of sulphur and some other ingredients at a high temperature, (see Hancock's patent, granted in November, 1843,) by which perfect elasticity is obtained, and non-liability to be affected by any heat or cold of climate. The present invention, for which a patent was granted in October, 1845, is for the application of the material above described for the purpose of buffer and other springs of railway carriages, according to various modes therein specified, and of which we shall now proceed to furnish a description. Instead of the steel springs, as at present, the patentees use a succession of rings or discs of India rubber of various diameters, from 4 in. to 6 in., according to the position and strength required, and from 1 in. to 2 in. in thickness. These are placed on the buffer-rod, (which passes through the centre,) and are separated by thin iron plates; each plate is provided with a conical collar, which serves to keep the India rubber firmly in its place, and at the same time admits of free expansion and contraction without coming into contact with the rod.

The advantages attending the use of this material over steel are numerous and striking. In the first place, their weight being scarcely a tenth part of that of steel, they may be placed in any part of the carriage, whilst the saving of weight in a long train (amounting to several tons) will, to some extent, economise the locomotive powers. Next we have their extreme simplicity, and the impossibility of their being damaged or broken, even in a collision. An opportunity occur-

red of proving this a few weeks ago, when an engine fitted with these buffers ran off the line near Hull, the iron-work being considerably damaged and broken, but the rings altogether unhurt. Another advantage in these springs is, the greater ease with which they are acted upon at first starting, being at the outset more flexible and yielding than steel; whilst the power accumulates so rapidly under pressure as to prevent the possibility of the buffer-head being brought to a dead hard stop, the benefit of which in concussions is sufficiently obvious. Another important and distinct advantage is the facility with which their power may be regulated. It will be evident, on inspecting one of the larger rings, that its power of resistance will be in proportion, first, to its diameter, (or, more strictly speaking, to its superficial area,) and next to the proportion which such diameter or area bears to its thickness; thus, a ring of any given diameter or area, 3 in. thick, would be much more easily acted on and reduced to half its bulk than one of 1½ in. thick. The convex form taken by the India rubber being in the latter case much more sudden, and requiring the exertion of nearly double the power. From this it will be at once evident that, by employing a greater number of separating plates in any given distance, you have the power of regulating these springs to the greatest exactness. The patentees state that the price of these springs (including patent right) will not exceed that of steel, but will probably be something less. Several engines and tenders have been fitted with these buffers at Wilson's Foundry, Leeds, and are now in daily successful operation on different lines. Several others are in course of erection at the manufactories of Messrs. Hick & Co., Bolton; Messrs. Sharpe & Co., Manchester; and Messrs. Lawson & Sons, Leeds. Several carriages have also been in daily use on the Great Western line for some months past, and are very highly spoken of. Upwards of 50 are being constructed at the works of Messrs. Fox, Henderson & Co., near Birmingham, for the Marie Antonia Railway, under the superintendence of Mr. Brunel. Experiments, as to the exemption of this material from being affected by the severest frost, have been made by the patentees during the past winter at St. Petersburgh and other parts of the continent, the results of which are quite conclusive. Many of the rings have also been subjected to a pressure of 60 to 100 tons, and reduced to the thickness of 1-16th of an inch without the slightest damage, resuming their shape immediately on the pressure being removed. One of the largest was lately put under Nasmyth's steam hammer, and after receiving more than 200 blows, remained equally uninjured. They are also about being applied as bearing springs, both for engines, tenders, and passenger carriages. Lond. Min. Jour.

The National Economic Gas Burner.

We have lately had an opportunity of testing the superiority of this new burner, which gives out a most brilliant light, perfectly white down to the lowest point of ignition, and which is, consequently, a sure

test of the perfect combustion of the gas, the proceeds given off being merely the union of the oxygen of the air with the hydrogen, to form the vapor of water, and with the carbon of the carburetted hydrogen forming carbonic acid. By the side of an Argand, a jet, or a bat's-wing, proceeding from the same double branch, the effect is most striking, and clearly evinces the true philosophical, although simple, principles on which it is constructed. The annexed is a diagram and description of the burner. Fig. 1 is a sectional elevation of burner and glass: A the gallery; B the glass, which gradually swells out from the circular burner in the manner shown, to suit the form of flame; C is the supply-pipe, from which spring two branches, *c*, *c*, surmounted by the circular burner, D, which has a certain number of orifices round its upper surface, similar to an Argand. The main principle of this invention is the button and stem E, which is screwed into the supply-pipe, as shown in the figure; the button is of brass, and the stem of iron, both solid, and by this application, the gas in rising through the supply-pipe, forms itself into a hollow cylinder, and becomes considerably heated in its passage upwards, and thus rendered more easy of combustion. Fig. 2 is the button and stem shown on a larger scale, F being the stem, and E the button fitting by a small orifice on to the small part of the stem at *f*. The inventors claim for it a saving of from 30 to 40 per cent. over other burners. Ibid.

Fig. 2.

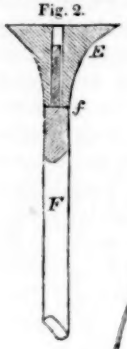
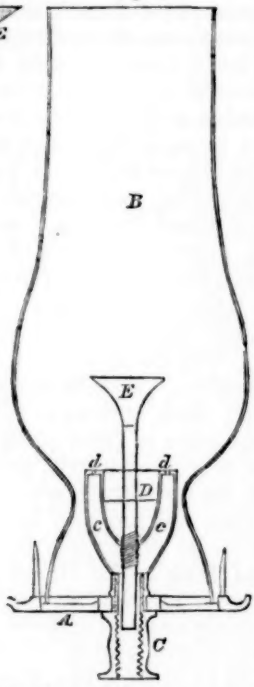


Fig. 1.



Important Experiments with the Gun Cotton.

A series of trial experiments, to test the strength of gun-cotton in blasting, as compared with the known powers of gunpowder, took place on Wednesday, in the Standedge tunnel on the Huddersfield and Manchester Railway. A correspondent thus describes the proceedings, and their results: The place selected for the experiments is in the midst of the great Yorkshire chain of hills, between Huddersfield and Manchester, where a tunnel is now constructing through huge masses of millstone grit, and which, when completed, will be the longest tunnel in England. The rocks, which are situate at a depth of 145 yards below the surface of the mountain, consist entirely of close grained quartz—of which some idea may be formed by the fact, that in 110

yards of the tunnel now completed, not one fissure or joint is perceptible. Holes were drilled of 2 in., 1½ in., and 1¼ in. in diameter in the millstone grit, and the charges of gun-cotton varied from 1-6th to 1-3d of the weight of powder ordinarily made use of in blasting. Cartridges containing the gun-cotton were dropped into the holes, with the patent fuse attached—and the quantities varied from 10 ozs. in the larger, to 6 ozs. in the smaller tubes; the quantity of gunpowder employed for similar blast-drills, varying from 1 to 3 lbs. The shots in the tunnel were 12 in number, 10 being charged with gun-cotton, and Nos. 4 and 11 with gunpowder. The shots numbered 2 and 7 in the south heading, and 12 in the north heading, were declared by Mr. Nicholson, the contractor, previous to their being fired, to be those on which the test of the strength of gun-cotton, compared with that of gunpowder, would be most certain, both as to charges and position. No. 2 was charged with 10 ozs. of gun-cotton, and did wonderful execution, exceeding in everything the expectations of both the engineers and miners. No. 7 was charged with 1¼ oz. of gun-cotton, and performed the same work as 6 ozs. of gunpowder. The crowning experiments were Nos. 11 and 12 in the north heading. No. 12 was charged with 16 ozs. of gun-cotton, against 3 lbs. 4 ozs. of gunpowder in No. 11, the shots exceeding anything the engineers or miners had before tested. The gun-cotton exploded first, and threw against the side of the heading, and broke into nine pieces, 220 cubic feet of rock, or about 15 tons weight. This shot, from its connexion with No. 11, was supposed to have assisted it materially. No. 11 removed to the distance of about one yard 224 feet of rock, or about 16½ tons weight, but was broken into six pieces only: thus showing the strength of the one over the other. The following properties were established in these experiments:—That the gun-cotton may be considered of three or four times the strength of gunpowder; that it is entirely free from smoke—a qualification of great importance in mining operations, as the miners can recommence work immediately after the blasts have been fired, which is not the case with gunpowder; that, in keeping the cotton on the works, and its being handled by the men, there is not so much risk from explosion, or loss from waste, as with gunpowder; that it ignites with more certainty than gunpowder; and, from the decreased size of the charge, the depth of the drill-hole may be diminished, and the power more concentrated; it also possesses all the qualities of the best gunpowder, and may be kept under water instead of in a magazine—it does not heat by keeping, and will explode at not less than 350.

Ibid.

Another New Planet.

From the London "Evening Mail" of July 12, 1847.

To the Editor of the Evening Mail.

Sir:—Hoping that the weather would have enabled me to accompany it with this night's meridian observations of the new planet,

whose discovery, I doubt not, it announces, I have delayed transmitting you, till the last moment, the following copy of a letter, which I received this afternoon from Professor Schumacher:

"*Altona, July* 6.

"My Dear Sir:—Mr. Hencke, the discoverer of Astræa, writes me that he has found a small star, that, indeed, seems to be a new planet. I have received his letter so late, that there is no more time to day to print the circular; so, till next Friday, you must be content with this previous notice. I subjoin his estimated places.

Believe me, my dear sir, yours very truly,

H. C. Schumacher.

"The star is of the ninth magnitude. Its estimated places, using Hour XVII of the Berlin maps, are—

	h.	m.		Right Ascen.	South Declin'n.
July 1	10	15	(mean time,)	257° 7′	3° 48′
" 3	11	45	" "	256° 40′	3° 51′

Perhaps, however, I may add, from the above data, the approximate places of the planet for the next four nights, at about 11 o'clock, mean time, at London.

	R. A. h. m. s.	*S. D.* deg. m. s.
July 9,	17 1 22	4 14 24
" 10,	17 0 29	4 18 18
" 11,	16 59 36	4 22 12
" 12,	16 58 43	4 26 6

The star lies nearly midway between Zeta and Gamma Ophiuchi; it is not in a very rich part of the heavens, has an hourly motion of about two seconds of time in right ascension, and of about ten seconds in declination, so, on a fine evening, it will be found without much difficulty.

J. South.

Observatory, Kensington,
Friday night, ¼ past 10, July 9.

From the same paper of July 14.

The New Planet.—We received yesterday, the *Universal Prussian Gazette* of Wednesday last, which contains the following official astronomical information respecting the new planet, in addition to that with which Sir J. South favored us yesterday:

"*Berlin, July* 6, 1847.—On the 1st inst., at 10h. 30m. P. M., the discoverer of Astræa, M. Encke, of Driessen, discovered a second star, not previously marked on his map, of about the 9th degree of magnitude, in 257° 6′ 7″ right ascension, and 3° 42′ 5″ southern declination. On the 3d inst., at 11h. 45m. P. M., it had retrograded to 256° 40′ right ascension, and 3° 51′ 5″ southern declination. These data refer to the equinoctial, which forms the basis of the academical celestial charts, one of which may serve for the purposes of investigation. According to the information afforded by M. Encke, the new planet, (for that it is such there is every probability,) was observed on the 5th of July, from the observatory in this city, on the meridian and in the refractor. The first gives the place as follows: Date, July 5; time, 10h.

48m. 28s.; right ascension, 256° 51′ 34″·5; south declination, 4° 8′ 27″·8. A comparison, made about three hours later, shows that the right ascension is daily diminishing by about 12 minutes and the southern declination, increasing about 6 minutes. The star is about the ninth degree of magnitude, and probably belongs to the smaller planets.

(Signed) ENCKE."

In the next number of the *Mail*, we find the following elements of the new planet.

SIR:—I forward to you the elements of the new planet, based upon the Berlin observation of July 5, and two accurate micrometrical observations, made here on the evenings of the 10th and 14th.

Epoch 1847, July 0.0, Greenwich M. T.

Mean anomaly,	283°	56′	54″·0	
Longitude of perihelion,	8	17	24 ·1	M. E.
Ascending node,	137	25	35 ·1	July 0.
Inclination,	15	2	56 ·1	
Angle of Eccentricity,	13	49	20 ·0	
Log. semi-axis major,	0·4016899.			
Siderial period,	4·004 years.			

From these elements I have calculated the following ephemeris, which will probably be of some assistance to your astronomical readers, until we have obtained further observations for the corrections of the elements. The positions are given for 0h. M. T. at Greenwich.

	Right Ascension.	South Declination.	Log. Distance from Earth.
July 18,	16h. 59m. 6·3s.	5° 35′ 39″	0·2140
" 21,	16 57 42·7	5 59 22	0·2183
" 24,	16 56 33·9	6 23 58	0·2229
" 27,	16 55 40·5	6 49 20	0·2279
" 30,	16 55 2·7	7 15 22	0·2331

The orbit is very similar to that of the planet Juno.

I remain, sir, yours, very respectfully, J. R. HIND.

Mr. Bishop's Observatory, Regent's Park, July 15.

Observations on the above Planet, made in the United States, at the Philadelphia High School, State of Pennsylvania.

HIGH SCHOOL OBSERVATORY, Aug. 6, 1847.

To the Editors of the North American and U. S. Gazette.

GENTLEMEN:—During a temporary absence from the city, my attention was called, by an article in the New York Herald, to the recent discovery of Hencke's second asteroid, at Driessen, on the first day of July last. On arriving in this city to-day, I learned that Mr. Russell Hinds' Elements and Ephemeris had been published in the Evening Mail, London, July 19th, and received in this city, and that the new asteroid had been observed on the nights of the 4th and 5th, at our Observatory, by Mr. Sears C. Walker, assisted by Messrs. Reynolds and Mason. It is of the ninth magnitude, and perfectly resembles a fixed star. I subjoin Mr. Hinds' Elements of the sixth Asteroid of our system. Its name has not yet reached us.

Epoch July 0, 1847,	283°	56′	54·0″	m. noon Gr'h.
Perihelion point,	8	17	24·1	m. eq. July 1.
Ascending node,	137	25	35·1	
Inclination,	15	2	56·1	
Angle of eccentricity,	13	49	20·0	
Mean distance,	0·4016899			
Siderial period,	4·004			

The following Ephemeris from Mr. Hinds' Elements, (corrected by Mr. Walker's observations,) will serve to point out the place of this new Asteroid in the heavens. The date is for mean noon Greenwich.

	Planet's Right Ascension.			Planet's South Declination.		
August 2,	16h.	54m.	21s.	7°	56′	24″
" 5,	16	54	17	8	23	32
" 8,	16	54	18	8	51	4
" 11,	16	54	45	9	18	54

The Elements of Mr. Hinds were computed from Encke's observation of July 5th, and Mr. Hinds' of July 10th and 14th. They resemble those of the Asteroid Juno. Mr. Walker's corrections of the Ephemeris here applied, are a diminution of twenty seconds of time in right ascension, and an increase of fourteen minutes of arc in south declination.

Mr. Hencke is the only astronomer, except Olbers, who has had the good fortune to discover two planets.

Respectfully yours, E. Otis Kendall.

New Comet.

M. Mauvais discovered, on Sunday night, about 11 o'clock, a new telescopic comet, between the constellation Cepheus and the Lesser Bear. It is composed of a nucleus tolerably distinct, announced by a nebulosity, extended on one side by a tail. The position of this comet was, on July 4, 1847, at 13h. 35m. 50s., average time, right ascension, 22h. 8m. 13s.; northern declension, 80° 26′. Galignani.

On the Use of a Mixture of Spirit of Wine and Camphine, as a Light for Optical Purposes. By John George Children, Esq., F. R. S.

I have lately assisted a friend in getting up an apparatus for dissolving views, &c., on a scale too large for sufficient illumination by the best Argand lamp, and we considered condensed hydrogen gas as too dangerous an agent for a plaything; especially in private houses in the country, where much must be left in the preparation of the gases, &c., to servants unused to such duties. We set to work, therefore to find a substitute that might answer our purpose; and, after a few trials, we obtained a tolerable light, by throwing the flame of spirit of wine on a surface of quicklime, by a current of oxygen gas, something after the manner of Lieut. Drummond's original experi-

ment.* The illumination by the flame of spirit of wine alone, however, proved to be too feeble; but, by mixing a portion of camphine (spirit of turpentine) with it, (which readily dissolves in alcohol,) in the proportion, by measure, of one part of camphine to eight parts of spirit of wine, of the specific gravity of ·841 at 60° F., (equivalent to the spirit of commerce at 60°,) we obtained a light amply sufficient, not only for my friend's dissolving views, but also for his microscope and physioscope, and perfectly free from all danger, or even possibility of explosion. My friend's screen is about 22 × 18 feet; and if it were twice as large, the light is quite capable of illuminating it brilliantly; and it shows a microscopic object, magnified from half an inch to thirty feet, or 720 times, linear, with great distinctness and beauty. I do not mean, that our toy can be compared to the almost solar intensity of the oxy-hydrogen light, also invented by the late Lieut. Drummond,† and now in common (too common?) use; but in a trial I made the other day, in Francis Street, with an apparatus hastily put together for the purpose, by Mr. Collins, I found its effect, measured by one of Wheatstone's photometer's, equal to that of seventy-six of Brecknell & Turner's best platted wick wax candles; and in several trials with our own apparatus, more carefully arranged, and with thoroughly well and recently burnt lime, (an essential caution,) we have found it quite equal to 108 of the same candles, and, on one occasion, to 120! The oxy-hydrogen light at Mr. Collins's, which was splendidly brilliant, being compared in the same manner, was found equal to 121 of the same candles.

In these experiments, no portion of the rays from either of the lights was intercepted; our object being to ascertain the comparative illuminating power of their entire surfaces, and not their comparative intensities only.‡

Were it not for the peculiar odor of the so-called naphtha, or coal-oil, which, to some persons, is highly offensive, even in its purest state, it might, when highly rectified, be advantageously substituted, in an economical point of view, for the spirit of wine. Four ounces of camphor, dissolved in a pint of that liquid, gives, under the same circumstances, nearly as brilliant a light as the spirit and camphine.

The light from camphine alone is, for a few seconds, intensely brilliant, but it is soon quenched in the enormous mass of unburnt carbon, which partly condenses on the lime, and partly escapes into the atmosphere, filling the whole apartment with a dense and almost suffocating cloud of floating black particles. A sufficient and well-regulated supply of oxygen gas might, perhaps, remedy this defect.

* Philosophical Transactions, 1826, p. 330. Drummond's object and ours were somewhat different. He wanted to get an intense but small sphere of light, "adapted to the nature of a (parabolic) reflector:" we also wanted as intense a light as we could obtain, but, as we could not advantageously use a reflector, one which should likewise extend over a much larger surface.

† Philosophical Transactions, 1830.

‡ Some attempts, indeed, were made in Francis Street, to compare the intensities alone; but the apparatus, from want of time to prepare a better, was too imperfect to allow me to place any confidence in the results. As far as they went, they were greatly in favor of the superior *intensity* of the oxy-hydrogen light. I hope to repeat the trials with a more refined apparatus.

Our apparatus consists of a copper lamp, with two tubes, lying close together, and each containing a wick formed of flat cotton, rolled up into a cylinder; and a cylinder of lime, about three-eighths of an inch long, and one-eighth of an inch in diameter, inclosed in a thin copper case. The pipe conveying the oxygen gas from the gasometer, terminates in a small jet, inclining upwards, which lies between the two wicks, slightly parted to receive it, and within rather less than one-eighth of an inch from the circular disc of lime, and about one-fourth of an inch above the lower edge of the copper case. We find that the common chalk of this neighborhood, furnishes a lime, which gives a better light than that from the Bristol, or any other limestone we have tried.*

Halstead Place, Feb. 13, 1847. Lond. Edin. & Dub. Mag.

High Temperature of Mines. By Robert Were Fox.

The temperature of some of the deeper parts of the United Mines† has long been observed to be remarkably high; and it has greatly increased with the increasing depth of the excavations.

Captain Youren, one of the agents of the mine, informs me, that near the eastern extremity of the deepest level, on the "*middle lode*," there is a spring or jet of water, discharging about 94 gallons a minute, at the temperature of 106½°‡ Fahrenheit. This level is 250 fathoms below the surface, and about 200 fathoms under the level of the sea. The "lode" has an underlie or dip of about 2½ feet in a fathom towards the north, and the water flows from its *northern* or *upper wall;* whilst from the opposite side, or *southern wall* of the lode, at the distance of only 3½ feet, there is another spring, discharging 30 gallons of water in a minute, at the temperature of 97¼° Fahrenheit. The air near both these springs was found to be at 104¼° Fahrenheit: and "*killas*" is the only rock which has been seen within 30 fathoms of them. Granite occurs at a considerable distance westward of the place; and two "elvan courses" traverse the mine in nearly the same E. and W. direction as the lode.

I have found that ¼ of a pint of the water from the warmer spring, contained 15 grains of saline matter, consisting of muriate of lime and common salt—in about equal proportions, with a trace of sulphuric acid, probably combined with lime. In the same quantity of the cooler water, only 10½ grains of muriate of lime and common salt were found, the latter in less proportion than the former,—and in this water also there was a slight trace of sulphuric acid. In both instances, the water was clear,—saline to the taste,—and without any metallic salt.

* Drummond also obtained the most brilliant light from chalk lime.

† This mine, (for it is one concern,) continues to produce abundance of copper ore. It is situated in the parish of Gwennap, about eight miles to the northward, or almost N. N. W. of Falmouth, and is several miles from the sea.

‡ The thermometer employed has been carefully compared with a standard one, and found to be ¼ of a degree too high; so that this small amount must be deducted from the results, making them 106·08°, 97·5°, and 104°, respectively.

It may, I think, be inferred from the saline contents of these springs, that they have a common origin or source; whilst their high temperatures indicate their having come from a considerable depth; and the quantity of water they discharge, that the lode, or rocks beneath, must be very pervious to it. In these instances, at least, there are no grounds for supposing that any chemical decomposition of the sulphur ores in the lode, has caused the high temperature of the water, or contributed to it in any degree, seeing that it contains no metallic, and scarcely any sulphate, salt.

The difference in the heat of the two springs may, perhaps, in part, be attributed to the tendency of the warmer currents to rise towards the upper wall of the lode; and, still more, to that of water at a much lower temperature, passing from superior strata down upon the inclined surface of the lower wall, where, mixing with the water rising from below, the temperature becomes modified, as well as the proportion of the saline contents.

It cannot be doubted that ascending and descending currents of water, more or less copious, and at different degrees of temperature, abound in the veins and fissures of the earth, and often at the junctions of different rocks, and that they must have a great influence in modifying the subterranean temperature, and in different degrees in different places.

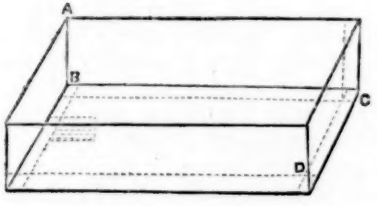
Common salt is of rare occurrence in our mines: its presence in the water in question, cannot well be attributed to the flowing of sea-water into the excavation, in consequence of its local or direct pressure; for, if some miles of distance from the coasts did not render this highly improbable, the considerable streams at very high temperatures, and very constant too, (as appears from observations made at different times,) are facts not consistent with such an explanation. If the subterranean jets of water were caused by the inroads of a neighboring sea, we should expect to find them at comparatively low temperatures, and these diminishing in proportion to the duration and amount of the influx.

The salt may, however, have been derived from the ocean, in consequence of the latter penetrating into the earth at its greater depths, or even at its lesser ones, which, under different given circumstances, it may be supposed to do. In either case, the salt water would, from its superior specific gravity, have a tendency to descend through the heated and less saline water in the veins, fissures, &c., where the fluids, becoming gradually more or less mixed and extended in different directions, might ultimately appear in some of our mines, brought up, perhaps, in the largest proportions, by the upward tendency of the more heated currents of water.—*Fourteenth Annual Report of the Royal Cornwall Polytechnic Society.* Lond. Mec. Mag.

Description of a New Mercurial Trough. By Professor Louyet, *of Brussels.*

In small laboratories, in which one of the chief points to be aimed

at is economy, in making researches on gases soluble in water, a small porcelain trough is commonly employed, capable of containing twenty to twenty-five pounds of mercury. The size of the bell-glass is proportioned to the capacity of the trough; thus only small quantities of gas can be collected,—quantities often insufficient for the desired experiments. With a view to obviate this inconvenience, I have modified the mercurial trough, so as to be able, without sacrificing economy, to collect considerable quantities of gas; and I have thought it may be of use to give a description of this new instrument, for the service of persons engaged in particular researches. This apparatus is formed of a small oblong oak box, to the bottom of which is cemented a glass, which fits exactly over its whole extent. The external surface of this glass is carefully polished and prepared. In the centre of one of its small sides, (it is rectangular,) is worked a narrow and deep groove, parallel to the large sides of the right angle. This opening corresponds to a hollow in the bottom of the box. This being done, I arrange the apparatus in the following way, when I desire to collect a gas over the mercury:—I procure bell-glasses, made of emery-stoppered bottles, the bottom of which is removed; the edges of these receivers are prepared and rubbed with emery, and apply accurately to the ground glass, precisely like the receiver of an air-pump. The edges may be very slightly greased, or this precaution may be dispensed with. The receiver is placed on the ground glass, where it is kept fixed with one hand; with the other hand the stopper is removed, and it is entirely filled with mercury; then it is carefully re-stopped. This being done, a small quantity of mercury is poured into the box, so as to fill the small cavity, and to cover its bottom with a stratum of some millimetres. The receiver may now be moved in all directions, and may be slid until it is over the small cavity, into which the extremity of the curved tube by which the gas is disengaged, is adapted. To one of the angles of the box, may be fitted a small pure iron stop-cock, by which the mercury is drawn off when the operation is ended. For greater clearness, I subjoin a figure, which represents this new trough of the dimensions which I have adopted.



A B=4½ centimetres.* B C=23 centimetres. C D=17 centimetres.
Depth of the longitudinal groove, taken above the glass plate,=2 centimetres.
Lond. Edin. & Dub. Mag.

* The centimetre is = 0·393708 of an English inch.

Mines and Steam Power of France.

The *Journal des Debats* has published two important articles on the mineral resources and steam power of France—supposed from the pen of M. Michel Chevalier—some of the chief details of which are here extracted. The statistics are founded on the year 1844. France, it is said, in the order of importance in coal mining wealth, takes the third rank; that is, comes after England and Belgium: in iron she occupies the second place. The absolute and relative consumption of iron and coal in those states in which it is officially known, is thus stated:

Countries.	Coal.	Iron.
England,	*Tons* 23,500,000	1,200,000
France,	5,400,000	480,000
Belgium,	3,200,000	120,000
Zollverein,	3,000,000	300,000

These figures give the consumption per head, in—

England, at	*Kilog.* 870	*Kilog.* 40 75
Belgium,	800	30 —
France,	154	13 71
Zollverein,	107	10 71

In 1844, France reckoned 425 mines of coal, covering about 450,000 hectares; 252 were in work, and 173 remained still in inactivity. The working of the 252 mines, the greater part of which were distributed among twelve principal basins, employed in 1844, 29,554 workmen, and produced 3,055,000 metrical tons of coal, 580,000 of anthracite, and 148,000 of lignite; total of combustible material, 3,783,000 tons, or in kilogrammes, 3,783,000,000. This was about the seventh of the production of England, and a little less than the total Belgian extraction; for, it must be noted, that, in addition to the quantity consumed at home, as before stated, Belgium exported in that year, 1,300,000 tons. Since 1839, the number of the mines worked in France had increased only as 6 to 8; but the extraction advanced from 28 to 30 per cent. Production, however, was still so much in arrear of consumption, as to require from Belgium and England 1,756,000 tons more. It is as yesterday only, so to say, that steam has been employed as a moving power, and yet it already furnishes the globe with a force estimated at more than 10,000,000 of horses, or 60,000,000 of men.—The actual effective force of steam engines in France is thus stated: For purposes of industry, the number is 3645, serving 4214 establishments and manufactories, and representing 45,781 steam horse power, or, at three draught horses per steam horse, 137,340 draught horses. Since 1839, this mechanical material had increased in the proportion of 45 to 50 per cent. The steam engines employed in navigation, form a total of 382 vessels, with a collective force of 12,789 steam horses. The increase under this special head, in six years, has only been from 25 to 30 per cent. The number of passengers transported in 1844, by steam vessels, was 3,287,000, and of merchandize 1,082,000 tons.—The number of the first, compared with 1843, was about stationary,

and of the latter, in decrease. The competition of railways would account for the fact. The locomotive machines gave, in 1844, a total of 292; serving 16 lines of railway. Of this number, 168 were of French workmanship, and 124 of foreign origin. This was an increase of 46 machines upon 1843, and of 88 upon 1842. In total, France possessed, in 1844, 4319 steam engines of all sorts, of the collective steam horse force of 62,950, or of 188,847 draught horses, or, at the rate of about six men to one draught horse, of 1,321,929 men. Such is the industrial army which steam now furnishes to France, and, whatever may be written against machinery, we do not find that the employment of this mechanical power has yet left the people bereft of work. Since the last four or five years, the number of steam machines augments rapidly in France, and yet, it is necessary to say, it represents scarcely $\frac{1}{12}$th of the mechanical power employed in England.

Lond. Min. Jour.

Receipts for Cleaning Engravings.

Put the engraving on a smooth board, cover it thinly with common salt finely pounded; pour or squeeze lemon juice upon the salt, so as to dissolve a considerable portion of it; elevate one end of the board, so that it may form an angle of 48 or 50 degrees with the horizon. Pour on the engraving boiling water from a tea kettle, until the salt and lemon juice be all washed off; the engraving will then be perfectly clean, and free from stains. It must be dried on the board or some smooth surface gradually. If dried by the fire or the sun, it will be tinged with a yellow color. Any one may satisfy himself of the perfect efficacy of this method, by trying it on an engraving of small value.

Another plan for cleaning engravings, at least for removing the chief part of that discoloration they may have acquired by age and exposure, and constant use, is to lay the print face downwards, in a vessel large enough to admit the whole lying quite flat; water, boiling hot, is then poured over it, sufficient to cover it to the depth of an inch or more; the print is allowed to soak in the water more or less time, according to circumstances. By degrees, the dirtiness disengages itself from the surface into the water. The print is then taken out and passed through fresh clear water, and held or hung up, for the superfluous moisture to run from it; and when this has sufficiently taken place, it is laid between sheets of white French blotting paper, and covered by a thick millboard, weights being laid on it, so as to have the effect of a moderate press; and it is thus left to dry. Where there is much soiling to be removed, and of old standing, it may be allowable to use, gently and carefully, a soft hair brush, whilst the print is saturated with the water, to assist in the disengagement of the impurities. Of course, throughout the operation, care must be taken in handling the print, lest it should tear, as plate paper is very soft when saturated with water.

An engraving, however soiled by age, smoke, ink, &c., &c., may be

speedily restored, by simply immersing it in oxymuriatic acid, permitting it to remain a longer or a shorter time, according to the strength of the solution, or the degree in which the paper of the engraving is stained.

To avoid the trouble of obtaining the acid by distillation, it is an equally effectual method to add one ounce of black oxide of manganese, or the red oxide of lead, to three ounces of common muriatic acid, diluted with water. At the end of two or three hours the acid will become colorless, and may be used after a little further dilution.

A slight deposit of saline crystals will be found on the print after it is removed from the solution, (in which, by the-by, it should remain at least an hour,) which may be discharged by repeated rinsings in pure water. It were as well to add, that the bottle in which the mixture is made should be strong, or its stopper not made very fast, as the elastic vapor extracted on making the mixture may cause an explosion.

London Art-Union.

Description of the Locomotive Engine "Namur."

The "Namur" is a six-wheeled engine, with the whole of the working parts outside.

Diameter of the driving wheels, . .	7 ft. 0 in.
do. supporting do., . .	3 ft. 9 in.
Distance between centre of the extreme wheels,	13 ft. 0 in.
Diameter of cylinder, ...	16 in.
Length of stroke, ...	20 in.
Number of tubes, ...	182
Length of ditto, ...	11 ft. 0 in.
Diameter of tubes, outside, . . .	2 in.
Length of fire-box, . . .	4 ft. 3 in.
Breadth of ditto, ...	3 ft. 5 in.
Area of fire grate, . . .	14 ft. 6 in.
Surface in fire-box, ...	62 ft. 0 in.
Surface of tubes, inside, ...	927 ft. 0 in.
Total surface, ...	989 ft. 0 in.

This engine is constructed for the Namur and Liege Railway, and has run on the London and North Western Railway, with every variety of train, a distance of 2300 miles. In the course of the experiments, the following speeds have been reached:—With a train of trucks loaded with coke, and weighing 80 tons, exclusive of engine and tender, 51 miles per hour on a level;—with a train weighing 50 tons, 62 miles per hour was attained, between Tring and Wolverton. But the most severe test an engine can be put to, is when it has no train behind it: an experiment of this kind was tried with the Namur, Capt. Addington, inspector general of railways, and Capt. Simmonds, his assistant, being on the engine at the time, with which a speed of 75 miles an hour was attained on level ground, going round a curve between London and Harrow. The speed was taken by Captains Addington and Simmonds, and both were perfectly satisfied with